Grinding and Finishing

WHEELS • GRINDING • HONING • LAPPING MACHINES • ACCESSORIES • PORTABLE GRINDERS • TUMBLING • ABRASIVES

The Magazine Devoted Exclusively to Abrasive Operations

B 603679
JUL 23 1956
AUG 3 - 1956

★ FEATURES

New Holding Device Assures a Chisel-Type Point—Safely

How to Grind Thin Steel Plates

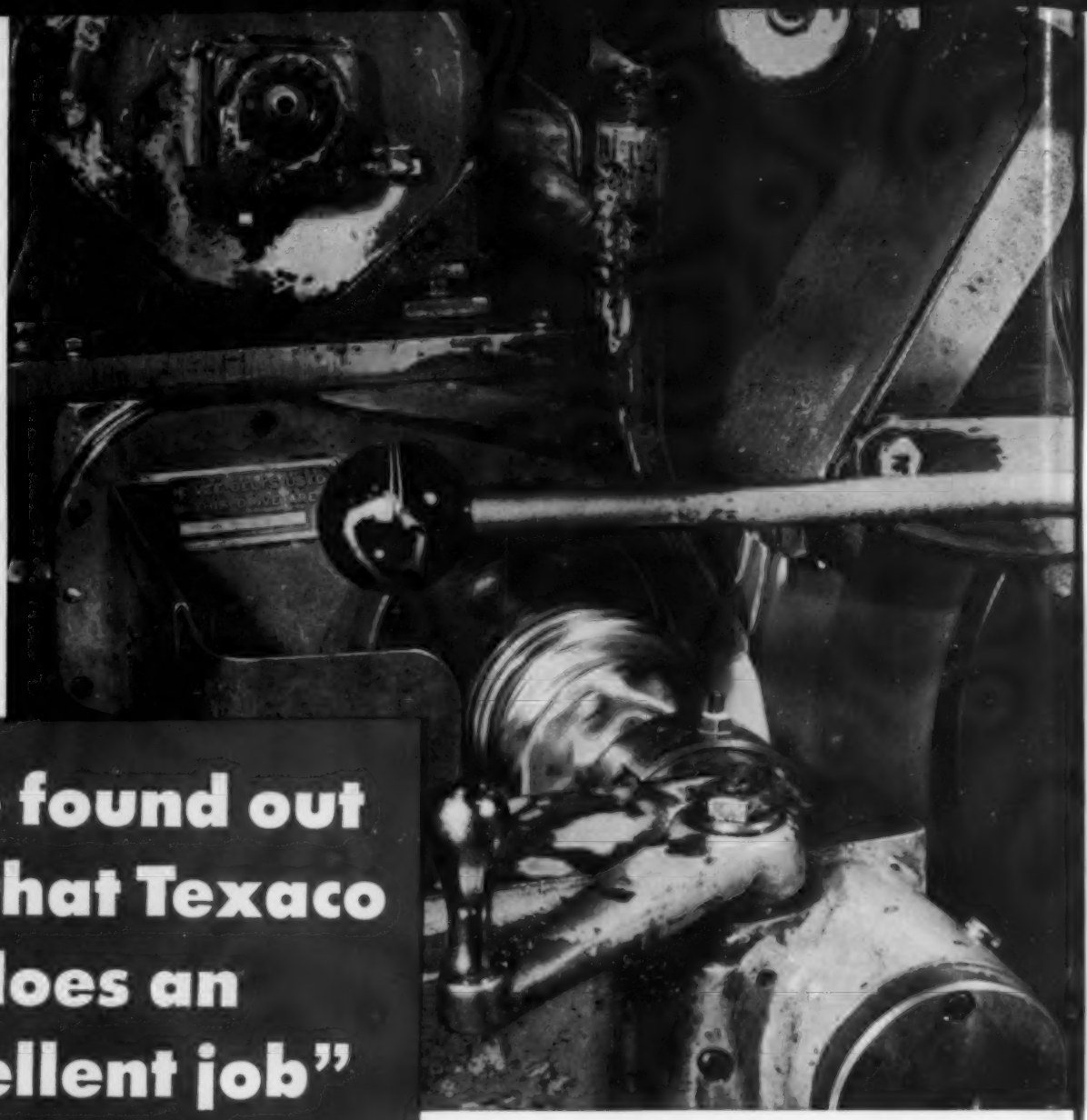
Today's Challenge: Meet Growing Precision Production Demands

Classifying Tool Steels by Grinding Characteristics

ALSO IN THIS ISSUE

Shop Hints and Kinks
Safety
Letters to the Editor
Free Literature
What's New in Equipment and Materials

JULY 1956



"We found out fast that Texaco does an excellent job"

. . . Jack & Heintz, Inc., Cleveland, Ohio

"ABOUT A YEAR AGO," reports Jack & Heintz, Inc., "we tested competitive cutting fluids against the Texaco products we had been using for a number of years. We found out fast that Texaco does an excellent job.

"For example: on our grinding operations, where precision is essential and low micro finishes necessary, we found that *Texaco Soluble Oil HW* (especially designed for hard water) gave us good rust protection and a fine finish at lean emulsion ratios. In addition, it did not load wheels and we had no odor complaints."

There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do all your machining better, faster and at lower cost. Texaco Lubrication Engineering Service will gladly help you select the proper ones. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Circle No. 311 on postpaid card

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

JUL 23 1956

B 603679

JULY, 1956—VOL. 2, NO. 3

Grinding and Finishing

Contents

Editor's Page 21

FEATURED ARTICLES

Safe Chisel-Type Production Grinding 25
by David W. Kinney
Classifying Tool Steels by Grinding Characteristics 31
by J. A. Weir
Why Ruin Abrasive Belts? 35
by Louis W. Kemp
Meet Growing Precision Production Demands 38
by A. H. Dall
Grinding Safely 49
by Edmund Mottershead
How to Grind Thin Steel Plates 53
by C. T. Bower
Automatic Internal Grinder 56

SHOP HINTS AND SHORT CUTS

Emergency Center Grinding Method 50
Superfinished Mill Rolls Deliver Longer Service 51
Automotive Valve Tappers Ground Automatically 52
Filtration of Coolants in Stainless Steel Finishing 52

DEPARTMENTS

Letters to the Editor 5
Available Literature 44
What's New in Equipment and Materials 58
News of the Industry 80
Index to Advertisers 82

EDITORIAL STAFF

William F. Schleicher, vice president and editorial director; *Jack Kenyon,* associate editor; *Ronnie Burritt,* consulting technical editor; *Richard C. Bush,* assistant editor.

BUSINESS STAFF

R. C. Van Kampen, president; *Vincent C. Hogren,* executive vice president; *J. E. Hitchcock,* vice president; *Oliver S. Pepper,* business manager; *John S. Todd,* production manager; *L. M. Schroeder,* art director; *Robert L. Spreckels,* circulation manager.

List of Hitchcock Representatives on Page 76.

Subscription rates: $6.00 per year in U.S.A. $7.50 per year elsewhere.

Copyright by Hitchcock Publishing Co., 1956, 222 East Willow Ave., Wheaton, Ill. Phone WHeaton 8-3400. Cable Address: HITCHPUB.

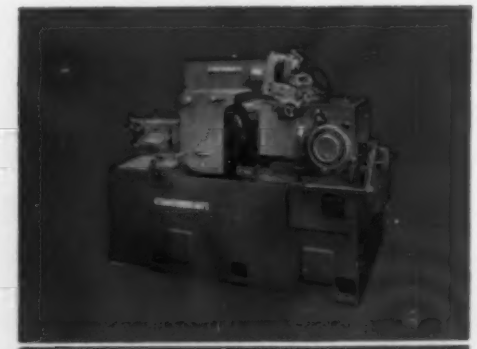
Accepted as controlled circulation publication at Pontiac, Illinois

CINCINNATI

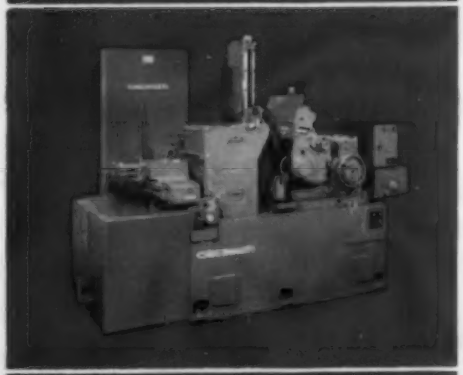
CINCINNATI® FILMATIC No. 0 Centerless Grinder. 5 hp spindle drive, 0 to ½" diameter capacity. Catalog No. G-640-1.

It Takes S

to Centerless ri
from Synthetic ap



CINCINNATI® FILMATIC No. 2 Centerless Grinder. 15 hp spindle drive, 1/16" to 4¾" diameter capacity. Catalog No. G-644-1.



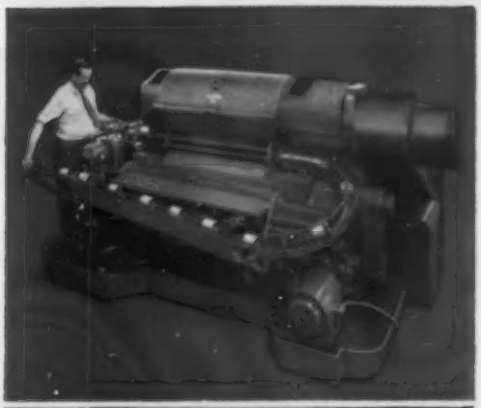
FILMATIC

CINCINNATI® FILMATIC No. 3 Centerless Grinder. 25 hp spindle drive, ½" to 6" diameter capacity. Catalog No. G-664.

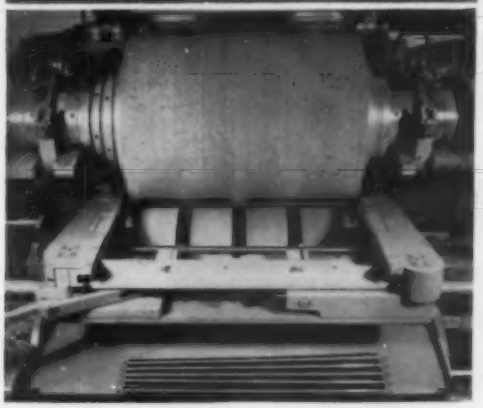
CINC

CINCINNATI® FILMATIC No. 4 Centerless Grinder. 30 hp spindle drive, ½" to 9" diameter capacity. Catalog No. G-538-2.

CENT
CENT



Pistons take a round trip through this **CINCINNATI® FILMATIC No. 5 Centerless Grinder** to get an extra fine finish and close tolerance sizing. The No. 5's (up to 75 hp spindle drive) are tooled up for the job.



Shotgun barrels receive a uniform lustre their entire length, comprising five tapers and a straight section, by grinding them on this **CINCINNATI® FILMATIC No. 6 Centerless Grinder.** The No. 6's (up to 75 hp spindle drive) are tooled up for the job.

Six

srind Everything

isapphire to Shotgun Barrels

Centerless is a versatile process of precision grinding. Railroad car wheel axles, billiard balls, synthetic sapphire, carbon sticks, 32" long gun barrels . . . all are ground at much lower cost on Cincinnatis than by any other method known today. And for these diverse parts, and thousands in between, it requires a line of Centerless Grinders.

Cincinnati builds the only complete line of centerless grinders, from 5 hp to 75 hp spindle drive. Cincinnati offers the only Engineering Service experience in centerless grinding extending over 30 years.

CINCINNATI Centerless is versatile, and variety of applications are still growing. May we help you reduce the cost of your precision grinding operations? Send blueprints and complete details, or if you handle your own tooling, write for catalogs on the machines in which you are interested. You will find brief specs. in Sweet's.

CINNATI

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

Circle No. 201 on postpaid card

on-the-job performance tests prove
IT PAYS to specify MACKLIN MM segments

A complete line of Macklin Segments provide fast cutting action without burring or checking. Fit any standard chuck.

Macklin MM Segments give better cutting action on hard-to-grind steels and carbides.

Here's Proof . . .

Macklin MM Segments increased production per segment wheel 127% in a large machinery manufacturing plant which surface grinds steel and cast iron machinery parts. Look at these figures . . .

	Macklin	Competitive Wheel B
Number of pieces ground per segment wheel	392	173
Segment life	13 days	6½ days
Dressings required	112 (in 13 days)	65 (in 6½ days)

Here are other typical MM Segment Performance test summaries:

Product	Performance Record
Cast iron table tops	Macklin MM Segments, 1000 pcs. Comp. Wheel B, 400 pcs.
Miscellaneous metal parts	Macklin MM life 2½ times greater than Brand C.
SAE 1335 heat-treated steel	Macklin MM removed as much metal in 15 hours as Brand B removed in 35 hours.

Here's why you get these results . . .

It's the unique MM construction consisting of a fine abrasive in pellet form which is engineered into MM Segments. This construction provides a constant flow of fine abrasive particles between the wheel and the work. The result? More metal removed per segment . . . fewer dressings required . . . and finer surface finishes.

But, don't take our word for it. Call your nearest Macklin distributor and arrange for a test on your own work. You'll be glad you did.

MACKLIN company

JACKSON, MICHIGAN

Circle No. 202 on postpaid card

Letters to the Editor

Automatic Parts Rackers

Would you please send me the address of the Bilt-Rite Tool and Die Company that built the centerless brushing unit and the automatic parts racker for the Detroit Transmission Division as described in the April issue of GRINDING & FINISHING.

H. J. Fochringer
Chief Industrial Engineer
Hydraulic Products Division
Thompson Products, Inc.

The builder of the centerless brushing units and the automatic parts rackers should have been given as Bilt-Rite Tool and Machine Company, whose address is 25780 Groesbeck Hwy., Roseville, Mich. A number of other readers have written for the correct address; GRINDING & FINISHING sincerely regrets the error.

Information Please

In your magazine GRINDING & FINISHING of February 1956 you mention in the article on Centerless Grinding on page 39 of your magazine a commercial cutting oil. Would you be good enough to let us have the address of one or several suppliers of such an oil.

SIA Swiss Industrial
Abrasives, Ltd.
Frauenfeld, Switzerland

The particular cutting oil referred to in the Centerless Grinding article on page 39 of our February issue is Thread-Kut 99, available from D. A. Stuart Oil Co., Ltd., 2749 S. Troy St., Chicago 23, Ill. However, similar products are also available from other oil companies although we do not have their particular trade names.

One of our foreign customers is looking for an American made sanding machine by the name of "Time-Saver." Could you give us the name and address of the manufacturer.

Export Manager
Gerard Kluyskens Co.
New York, N.Y.

We believe the sanding machine your customer is looking for is manufactured by Timesavers, Inc., Box 11, Robbinsdale 22, Minn.

Dumore Hand Grinders precise spindle alignment makes them ideal for close tolerance tool and die production finishing.

DUMORES keep on grinding on toughest production jobs

Built for rugged duty as well as precision, Dumores handle deburring and other tough grinding jobs with ease.

A Dumore Flexible Shaft puts the power in your hand for that extra control on close tolerance work with carbide or mounted wheels and points.

There are two good reasons why you can always depend on Dumore Hand Grinders for continuous duty on the toughest production bench work. First, they have perfect spindle alignment and rigidity. This means longer wheel life, less wheel changes, fewer interruptions. Secondly, this perfect alignment is assured for the life of the grinder by no less than *three* precision bearings housed in steel insert. In short, a Dumore is always ready, whether it's for the finest tool and die work or the most stubborn deburring job.

You'll find too that Dumore has the world's most complete line of Hand Grinders from 1/20 to 1/4 hp and speeds up to 35,000 rpm. A grinder for every job!

Flexible Shaft Tools

These light, easy-to-use tools will cut the cost of your small parts finishing. A complete line of tools with a power range from 1/20 to 1/4 hp.

WRITE FOR CATALOG 55
for detailed information on
Dumore Hand Grinders and
Flexible Shaft Tools.

DUMORE
PRECISION TOOLS

AUTOMATIC DRILL UNITS
TOOL POST and HAND GRINDERS

1326 Seventeenth Street Racine, Wisconsin

Circle No. 203 on postpaid card

Here's a brand-new

"2-in-1"

BUCKEYE ABRASIVE TOOL!

handles like an angle...

runs like a vertical...

for 4", 5", 6" cup wheels
for 5", 7", 9" sanding pads

AND, IT'S QUIET!

Take hold of this newest Buckeye abrasive tool . . . it has the feel and balance, and the ease of handling you expect only in an angle tool. And—it has the gearless efficiency and direct air flow of a vertical tool.

Now, turn it on. That handy twin-trigger throttle gives you pin-point control of the air flow from zero right on up to top speed. Notice how quietly it runs? That's the built-in muffler doing its job. The exhaust deflector, underneath, can be adjusted to any angle you choose.

This NEW Buckeye abrasive tool is available in five speeds, comes complete with dead handle and guard. If you'd like more information, just write—now—for our Catalog A-10. If you'd like to see what this new tool can do on your work, just tell us so and we'll make the necessary arrangements—without obligating you at all.

Buckeye Tools CORPORATION
DIVISION 45 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

Circle No. 204 on postpaid card

We are interested in representing a concern that reclaims or refinishes abrasive cloth belts and abrasive discs. Can you give us any information as to where we may get in touch with such a concern.

H. L. Schultz
Abrasive Products & Equipment Co.
Tonawanda, N.Y.

If any of our readers would like to get in touch with Mr. Schultz, please write to GRINDING & FINISHING and we will forward your letters where you will receive more information.

Centerless Grinding

Please forward 10 reprints of the article "Centerless Grinding" which appeared in GRINDING & FINISHING November 1955 through March 1956. Enclosed is my check for $3.50.

C. E. Greeley
Framingham, Mass.

Would you please send me reprints of the series on Centerless Grinding and Barrel Finishing. The necessary fee is enclosed.

Also I would like to know if reprints are available of the article on Double Disc Grinders from the May 1956 issue of GRINDING & FINISHING. In the same issue, the paper by Dr. H. R. Letner drew my interest and I would like to know how I could get more information, or his complete report on the subject.

I am a tool engineer for the IBM Corporation and currently working on a double disc grinding assignment.

Willard R. Larson
Tool Engineer
I.B.M. Corporation

Centerless Grinding reprints have been sent but as yet the Double Disc Grinder story has not been reprinted. In complying with your request for more information on Mr. Letner's article, we are sending tear sheets from the May 1955 issue in which a previous article by Mr. Letner appeared. We also suggest that you write the Mellon Research Institute in Pittsburgh, Pa. for additional information on this subject.

Grinding Single Point Tools

Will you please send me tear sheets of the article "Grinding Single Point Carbide Tools" by H. Reichardt, which appeared in the October 1955 issue of GRINDING & FINISHING.

C. D. Ferguson
The Warner & Swasey Co.
Cleveland, Ohio

Tear Sheets Sent.

OVER 200 SHAPES

Do you have to grind parts in small, almost inaccessible spots? Hard-to-get-at corners or cores—fillets or radii? Then ask to see Chicago Wheel's line of mounted wheels and points. You'll find the exact wheel you need for the job. There are over 200 different shapes to select from for every imaginable grinding operation.

CHICAGO

Mounted Wheels

CHICAGO MOUNTED WHEELS are manufactured under positive density control to insure peak job performance.

GUARANTEED to stay on their mandrels. They are perfectly balanced, easily dressed, and hold their shape.

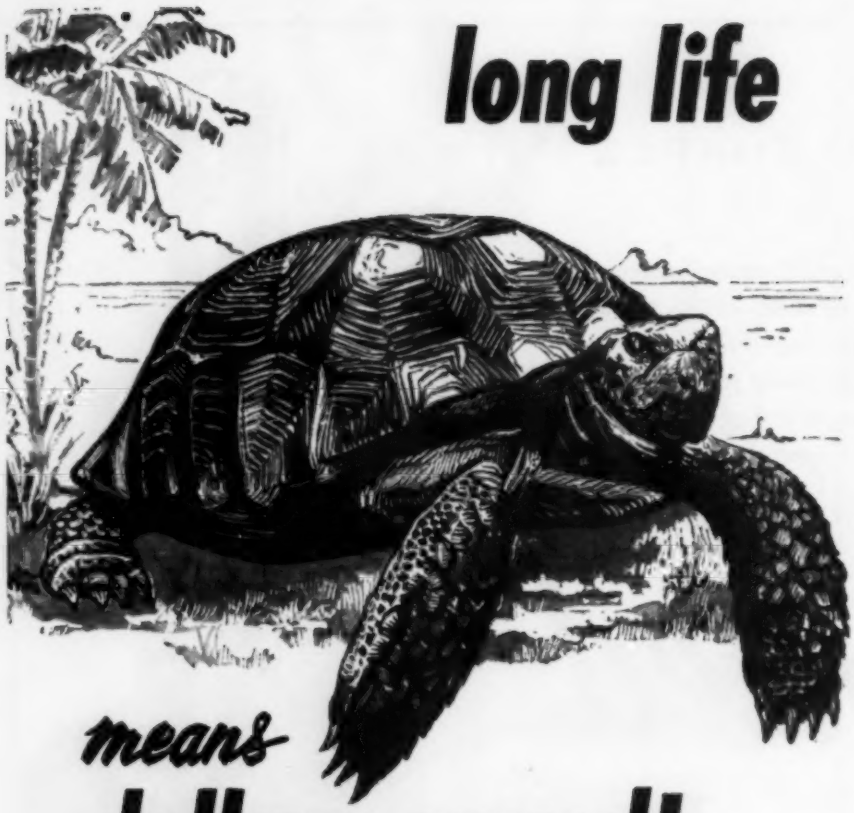
SAVE TIME, MONEY, MATERIALS using Chicago Mounted Wheels. There is almost an infinite number of combinations of dimension, shape, grain size and bond.

Write for Chicago Mounted Wheel Catalog today—shows shapes, sizes and price.

CHICAGO WHEEL & MFG. CO.

Dept. G • 1101 West Monroe St. • Chicago 7, Ill.

Circle No. 205 on postpaid card



long life

means

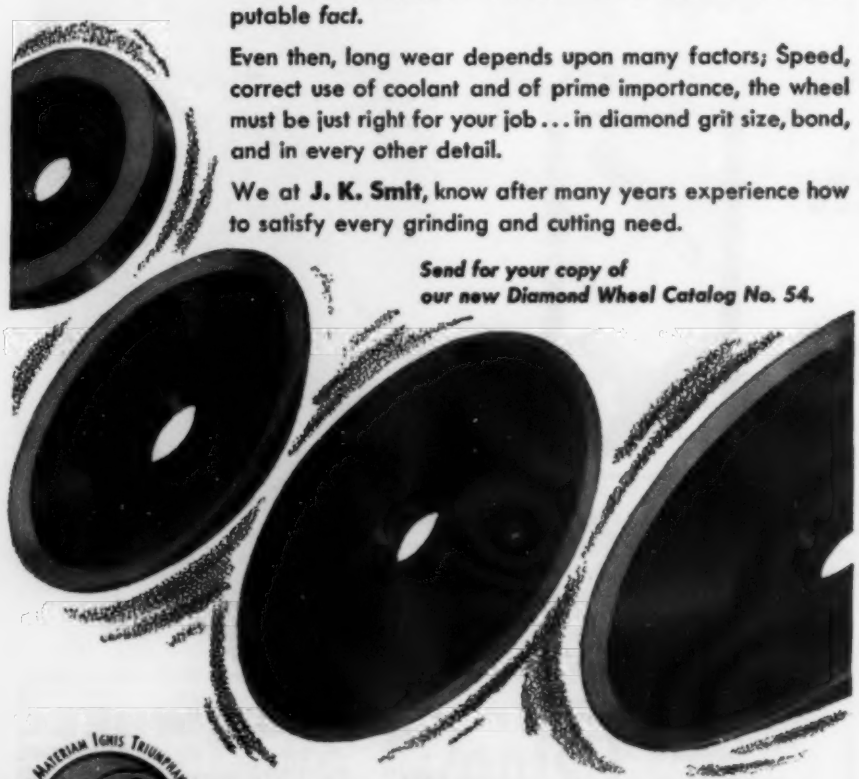
dollars saved!

Whether a 200 year old tortoise would admit this statement is debatable, but with Diamond Wheels it is an indisputable fact.

Even then, long wear depends upon many factors; Speed, correct use of coolant and of prime importance, the wheel must be just right for your job . . . in diamond grit size, bond, and in every other detail.

We at **J. K. Smit,** know after many years experience how to satisfy every grinding and cutting need.

Send for your copy of our new Diamond Wheel Catalog No. 54.



J. K. SMIT & SONS, INC.

HOME OFFICE AND PLANT

MURRAY HILL NEW JERSEY

Additional plants in London, Paris, Amsterdam and Toronto, Canada

Circle No. 206 on postpaid card

Grinding Standards

Although we receive numerous copies of GRINDING & FINISHING, it seems through interdepartmental handling the May 1955 issues have been removed.

It would be most helpful to us in our Standards Development Program for the grinding department to obtain this issue, or specifically the article by E. A. Cyrol, "How Grinding Standards are Established with Standard Data."

Thomas K. Walker, Jr.
Industrial Engineer
Borg-Warner Corp.
Bedford, Ohio

Tear Sheets Sent.

Correct Address

Please forward name and address of company referred to as National Diochemical Company, Chicago, Ill., manufacturers of Disaver filters for collecting diamond dust.

The above company is referred to in your January issue of GRINDING & FINISHING magazine on page 40 in the article "There's Money in your Sludge," by Dick Bush, Assistant Editor.

F. J. Arens
The Automatic Refrigerating Co.
Hartford, Conn.

The address is the National Diochemical Co., 3106 W. Lake St., Chicago 12, Ill.

Who If Not You?

Many thanks for the slogan card, "Who If Not You, When If Not Now?" Would it be possible for you to send ten more copies of same. I have heard many favorable comments and would like to present copies to admirers.

H. A. Strake
Trojan Specialties
St. Louis, Mo.

Enjoyed your editorial of December 1955. Would you kindly send me one of the "Who If Not You, When If Not Now?" cards. I felt it was very appropriate for us all.

Ward D. McGill
Industrial Engineer
Minneapolis Honeywell Reg. Co.

Cards Sent.

Diamond Dressing Tool

We are interested in obtaining several copies of a story printed in the May 1956 issue of GRINDING & FINISHING. The article appears on page 59 and is entitled "Diamond Dressing Tool at Plymouth" by D. J. Wallace. Your cooperation will be very much appreciated.

J. M. Newell
Clark & Bobertz, Inc.

16 surfaces

...on this Garrison Gear Chuck

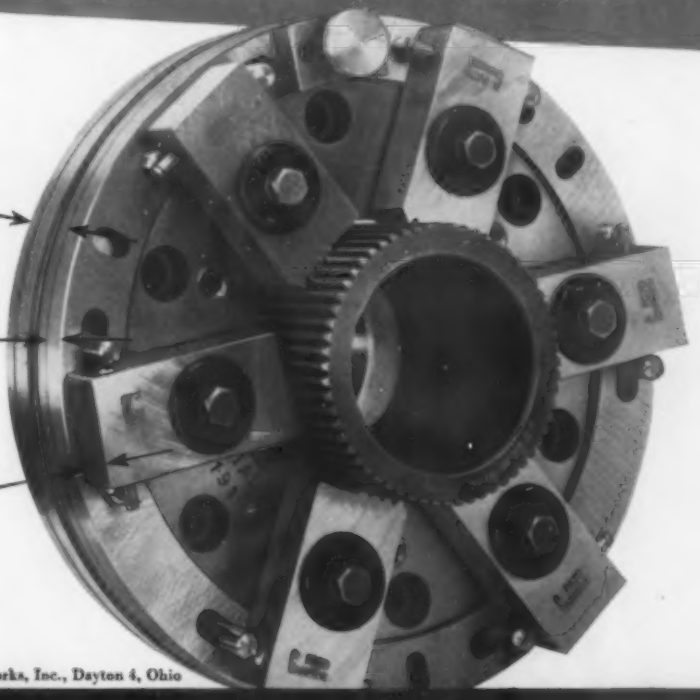


Photo courtesy of Garrison Machine Works, Inc., Dayton 4, Ohio

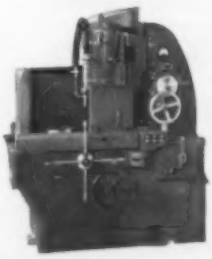
are Blanchard ground for precision

As every machinist knows, machine tools impart their precision through their chucks. That's why chuck dimensions and tolerances are of critical importance . . . and why Blanchard Surface Grinders are commonly used to produce the flat surfaces required.

Blanchard Surface Grinders are ideal for all kinds of precision grinding jobs. They produce extremely close tolerances for flatness, size and parallelism . . . *at low costs and high production rates.* Many Blanchard users grind surfaces flat to within 2 to 4 light bands, parallel to less than .0001", with dimension tolerance of .0002", and surface finish to better than 3 micro inches.

Whether your work involves precision machining or rapid removal of stock, take the advice of master machinists . . .

PUT IT ON THE BLANCHARD



No. 11 Blanchard Surface Grinder

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

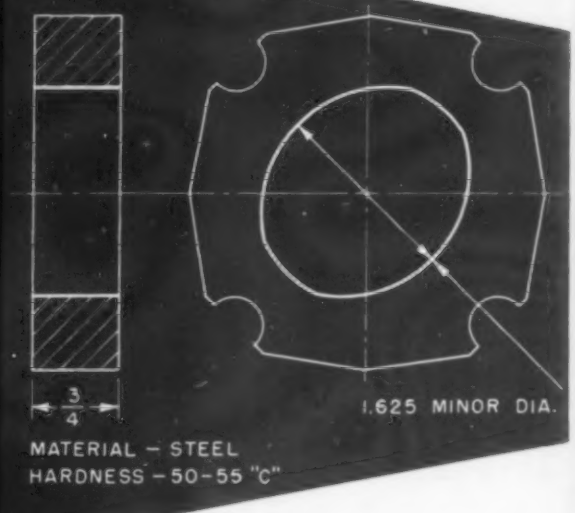
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

Circle No. 207 on postpaid card

The New BRYANT Vertical Cam Grinder

BRY-ALIGN CENTALIGNANT



Increases production up to 4½ times!

Like the "Centalign", this special vertical machine offers you tremendous savings in your grinding production.

A typical production job is the grinding of 2-lobed bores in hydraulic pump parts, at the rate of 130 to 140 pieces per hour. This compares with a production rate of 30 pieces per hour attained by previous methods. Work parts are hand-loaded into a special high-speed chuck, rotating at 100 RPM. Stock removal is .015 to .020.

The Bryant Vertical Cam Grinder does more work better, because it incorporates many important new features. For instance: greater rigidity and stability; faster stock removal and greater accuracy; workhead, wheelhead and longitudinal and cross slide motions of the wheelslide in one common plane; machine function controlled by programming cam sets which can be readily interchanged.

These and other features of the Bryant Vertical Cam Grinder assure you of a grinding efficiency rate never before attained.

Investigate today — ask for DETAILS!

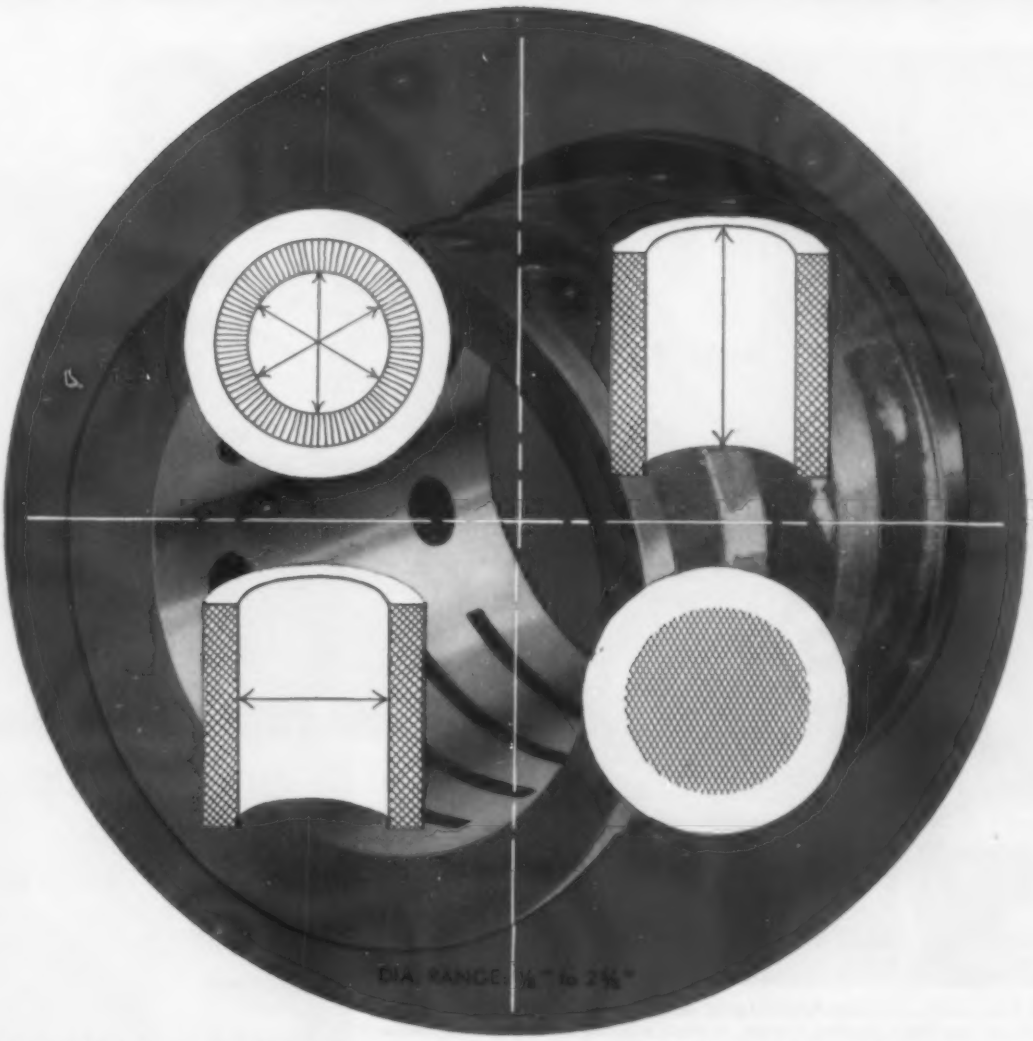
BRYANT Chucking Grinder Co.

85 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery

Circle No. 208 on postpaid card



FOUR-DIMENSIONAL HONED HOLES . . . ACCURATE ALL WAYS

IN DIAMETER—Semi-skilled operators can bring the hole up to final size quickly . . . with production tolerances of .0002" to as close as .000025", if required.

IN ROUNDNESS The work centers itself on the mandrel . . . producing a perfect, **geometrically** round hole.

IN STRAIGHTNESS Levels all internal irregularities for **end-to-end precision.** Corrects taper, waviness, hourglass and barrel shapes.

IN SURFACE FINISH Guarantees specific surface finishes as required . . . as fine as 2 micro-inches RMS in hardened steel.

SUNNEN HONING ASSURES EQUAL DISTRIBUTION OF BEARING LOADS—LONGER LIFE OF MATING PARTS

TODAY'S TOLERANCES AND FINISHES CALL FOR HONING
clip and mail coupon now

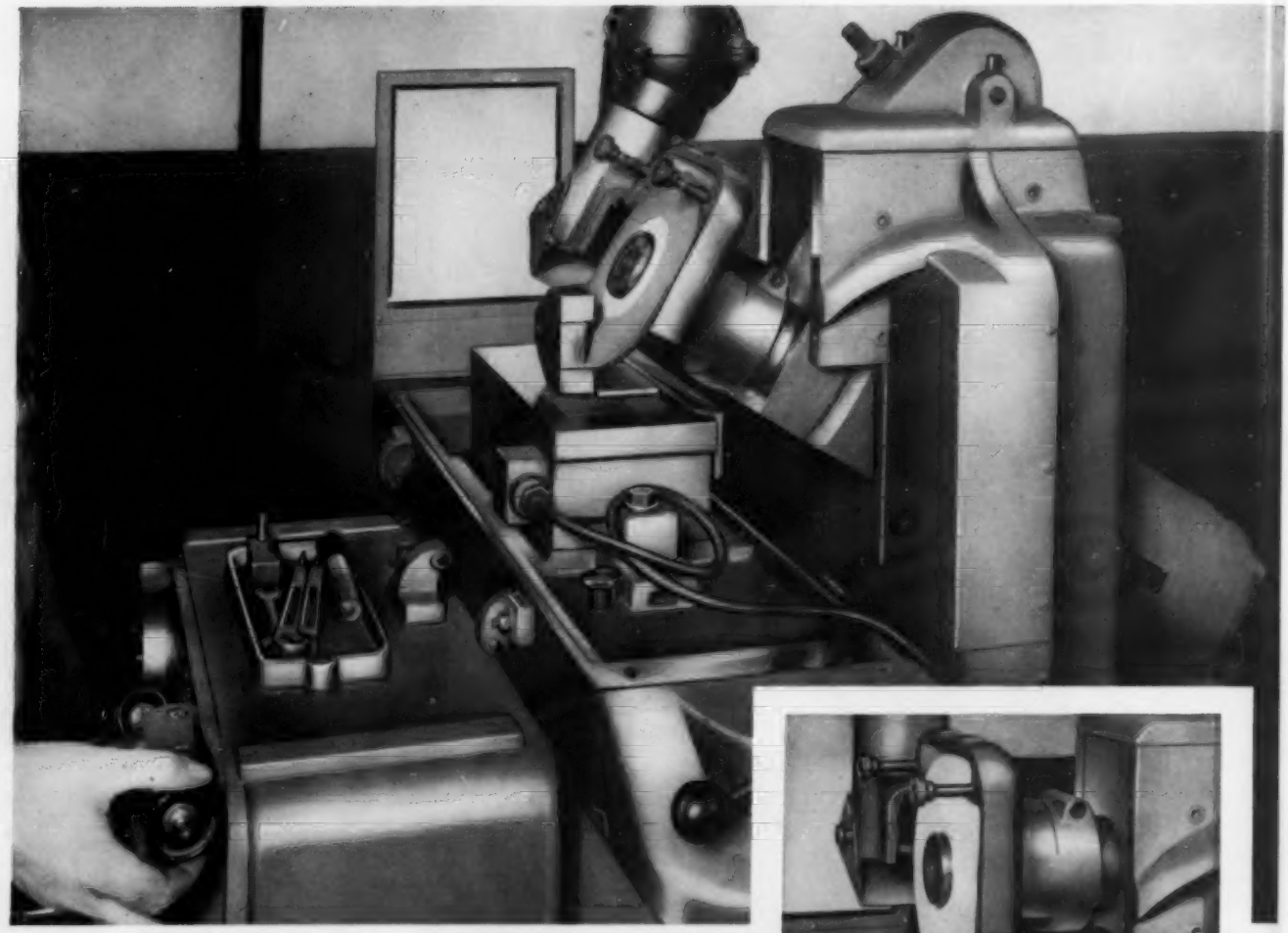
6858

SUNNEN
PRODUCTS COMPANY
7946 MANCHESTER AVE. • ST. LOUIS 17, MO.

☐ *Have engineer call for free demonstration*
☐ *Send case histories and technical information*

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

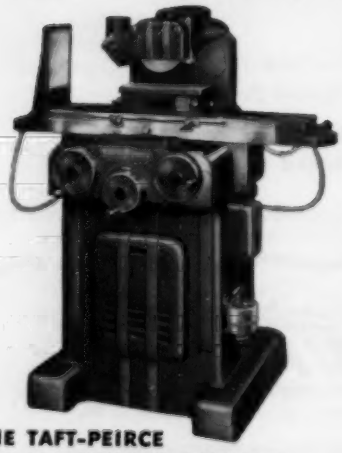
Circle No. 209 on postpaid card



This is the new way — Taft-Peirce angular surface grinding, as compared to conventional side wheel grinding, at right. Workpiece is held on Superpower Electromagnetic Chuck with fine mesh face plate. (Wheelhead cover removed to demonstrate operation.)

T-P Tilting Wheelhead

Cuts Setup and Grinding Time in Half!



THE TAFT-PEIRCE NO. 1 PRECISION GRINDER

Tilting wheelhead is mounted between two pairs of circular dovetail slides, permitting swivelling of the entire spindle about the wheel center — through an arc from horizontal to 30° below center. Spindle can be set to any desired angle to simplify and even eliminate the setups frequently required for difficult grinding operations.

Same workpiece, same operation — but what a difference in time and cost.

Exclusive Taft-Peirce *angular surface grinding* makes it possible to complete a setup and grinding operation in less than half the time required with conventional side wheel grinding. Just set piece on magnetic chuck, dress wheel, and grind! And there's no problem with burrs, working over-size, curved surfacing, or wheel glazing.

All this, plus the extreme accuracy of the No. 1 Precision Surface Grinder. Operators easily grind to .0001″, and to .00005″, with experience. Surfaces are so smooth they seal without lapping; so accurate, they wring!

See these remarkable features demonstrated — we're sure you'll be convinced of the extra savings this grinder will produce. Contact your local T-P representative or write: Taft-Peirce Manufacturing Co., Woonsocket, R. I.

THE TAFT-PEIRCE FAMILY...

- Magnetic Chucks
- Precision Gages
- Air Gages
- Grinding Machines
- Lapping Machines
- Tool-Room Specialties

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

T-P Means TOP Precision

Circle No. 210 on postpaid card

CCC

CLEAR · COOL · CLEAN and NO ODOR

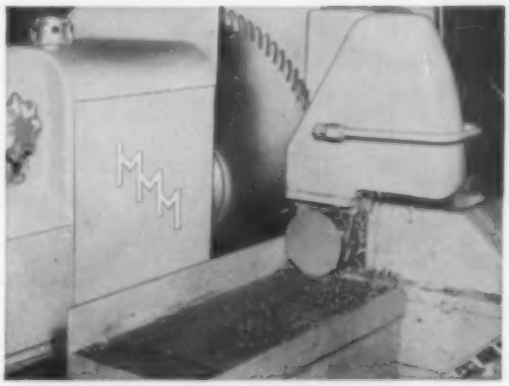
A "clean deal" with 3 MOTCH & MERRYWEATHER PRODUCTS

TRIPLE C GRINDING COOLANT

Transparent solutions; watch work progress. Soluble in water; no emulsifying action. Maximum cooling. Grinding wheels stay clean and free-cutting; minimum wear and dressing. No disposal problem. No slippery work-pieces. No foaming. Non-flammable. *No objectionable odor,* even in hottest weather.

TRIPLE C CUTTING COOLANT

Extreme pressure lubricity lengthens tool life. Transparent, water-soluble, non-oily, non-greasy. Non-gumming, non-galling, anti-rust, friction-reducing. Foamless, smokeless, vapor harmless, no skin infection; no fire hazard. Agreeable odor — *never foul.* A definite aid to production and accuracy.



Also TRIPLE C MACHINE CLEANER

Dissolves accumulated insolubles in coolant systems; cleans thoroughly at lowest labor costs. All Triple C advantages: Clean, Cool, Clear; safe, preventing bacteria at source. And *never a foul odor.* Your men will like it!

A good coolant works best in a clean machine

THE MOTCH & MERRYWEATHER MACHINERY CO.

Cutting Tool Manufacturing Division

Stocking Dealers in All Principal Industrial Centers

1250 EAST 222nd STREET, CLEVELAND 17, OHIO

Circle No. 211 on postpaid card

here's how you "govern" the government

Much as we revere and respect this system of ours, we don't want the government running our lives.

The best government is one that's closest to the people. And there's just one way to keep it under control.

Vote.

Every time you get a chance.

Vote November 6, for sure.

Vote to elect the ones you want representing you. To keep the ones who are doing you proud. To get rid of the ones who are not so hot.

You're the boss, however you vote. No matter who's elected, you pay their salaries and paint their offices and keep watching over them as they work.

Even if the ones you're "agin" happen to win, they're obligated to the minority, too. They're servants of *all* the people, not just those who voted for them.

Your vote prods, approves, protests, demands, restrains, rewards.

Vote—so you and your children after you always can.

THE AMERICAN WAY OF LIFE MUST BE PRESERVED FOR THE NATION

PUBLIC SERVICE ADVERTISING COUNCIL

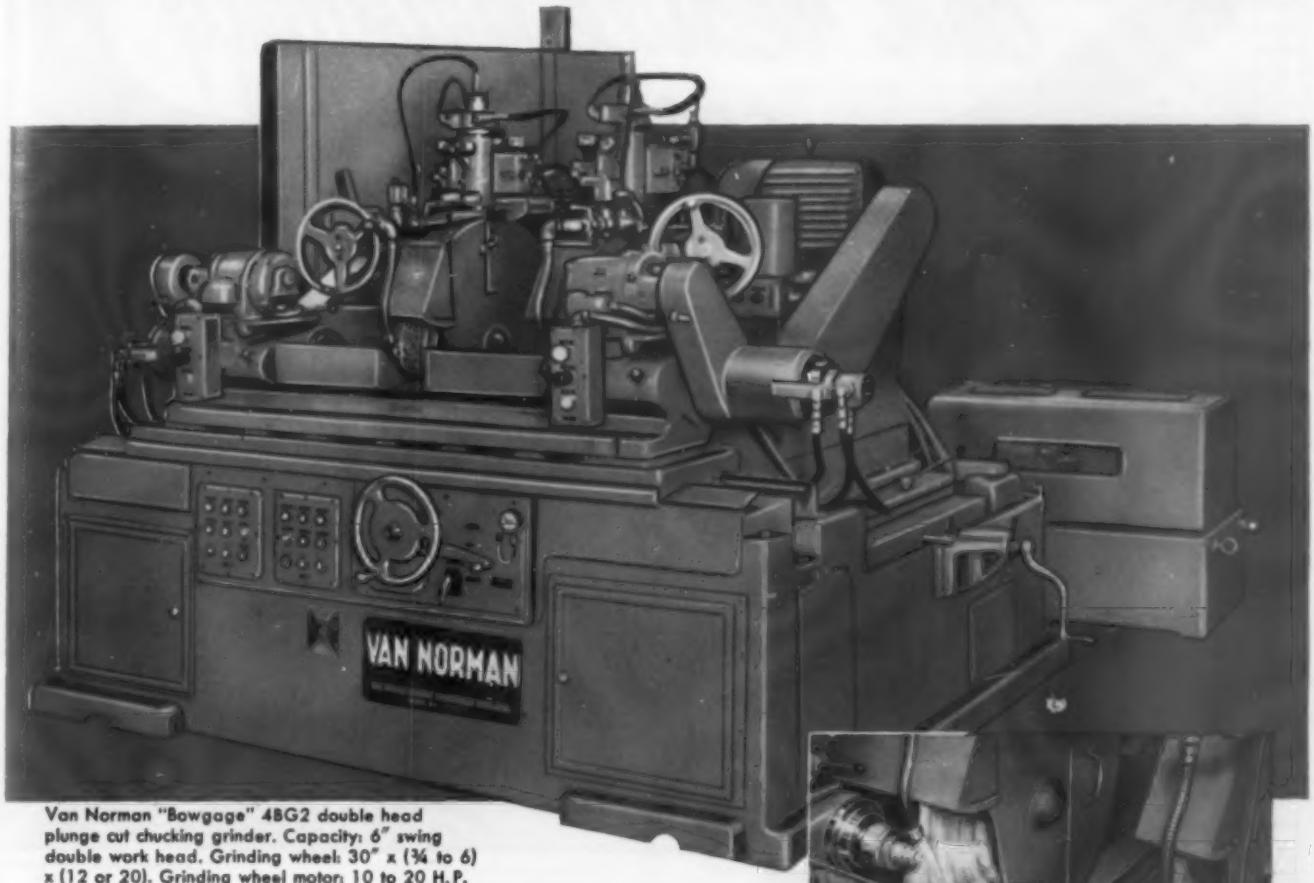
See You at the POLLS!

VAN NORMAN

"Engineered for the Job"

"Bowgage" Production Grinders

Out Perform Them All for Speed, Accuracy and Low Cost Grinding



Van Norman "Bowgage" 4BG2 double head plunge cut chucking grinder. Capacity: 6" swing double work head. Grinding wheel: 30" x (¾ to 6) x (12 or 20). Grinding wheel motor: 10 to 20 H.P.

Grinding Universal joint flange on the Van Norman "Bowgage" 4BG2 .022 stock removal — 1.625 diam. — 15 R.M.S. — Maximum 480 pieces per hour.

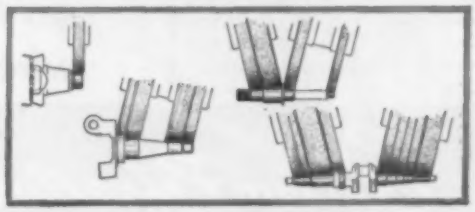
You just can't beat Van Norman "Bowgage" Production Grinders for fast, economical mass production. These massive, rugged grinders are "*engineered for the job*" to meet your exacting requirements.

Illustrated is the Van Norman "Bowgage" 4BG2 double head plunge cut grinder designed and built for a major automotive manufacturer. Day after day, this 14.8 ton rugged brute and other single and double head grinders are showing substantial savings by keeping production up and costs down.

If you have a mass production grinding problem, let Van Norman Engineers help you solve it. Write for their help, today.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company. Lease and Conditional Sales Contracts not available to Export.

Sketches illustrate actual grinding applications performed for users of single and double head plunge cut special purpose grinding machines.



VAN NORMAN MACHINE COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**

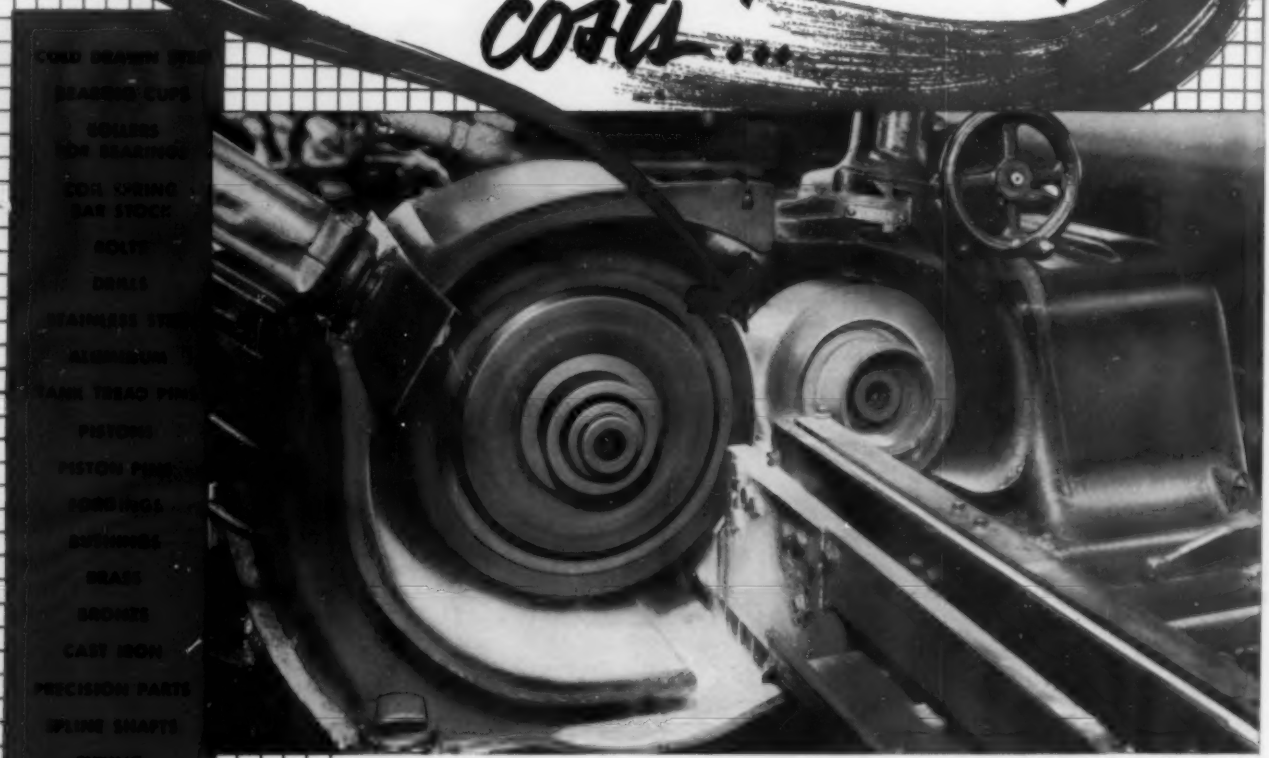
Manufacturers of — **Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.**

Circle No. 212 on postpaid card

Electro
SINCE 1909

Processing by Superior

Centerless WHEELS can reduce grinding costs...



(Guard removed from photo)

A test will demonstrate why Electro Centerless Grinding wheels are *"Increasingly Superior"* . . . why our CUSTOM DESIGNED SPECIFICATIONS give you the utmost for your grinding wheel dollars.

Electro Refractories & Abrasives Corporation

344 DELAWARE AVENUE, BUFFALO 2, N. Y.

Manufacturers of ELECTROCARB, Silicon Carbide Abrasive Grain

Circle No. 213 on postpaid card

This is why you need only ONE master!

This air gage system is basically different from that of other air gages. One side of this system—the measuring side — is *rigidly fixed.* There is no adjustment and measurements *cannot vary.* Hence, the gage *is linear* over its long range and *can be calibrated* and *set with a single master.* Because of this, the Dimensionair is an air gage of dependable stability. *It cannot drift . . . throughout its long range.*

The balancing side of the system has a *single* zero adjustment. This enables you to set the Dimensionair positively and instantly to zero, *with a single master.* Excess bits of dirt, oil or water *do not* affect the Dimensionair any more than they do other air gages. *But,* some gages are too *insensitive* to show up such failure.

If you are familiar with ordinary air gages requiring two masters, you'll appreciate the advantages of using *one* master. You *save half the cost of masters . . .* set the gage easily and simply . . . experience, for the first time, the feeling of *dependable, non-drifting,* precise measuring.

The Dimensionair's basic system enables it to be *combined directly* with electrical and electronic units as used with *Machine Control* and *Automatic Sorting Gages.* This obviates the accessory equipment required by other air gages and permits higher speeds, greater precision — with assured stability. It is much easier to set the gage to the spread between electrical contacts; e.g. the spread between the machine's fine feed and the finish feed. Adjusting to zero *does not* affect this spread setting.

Check these facts for yourself. Have a Dimensionair installed in your plant now.

Compare it with any other air gage you may already own or any you may wish to have brought in for comparison.

FEDERAL PRODUCTS CORPORATION
6447 Eddy Street • Providence 1, R. I.

1. **One master, only, required.**
2. **Constant, positive accuracy.** Balanced air system positively controlled. It can't drift.
3. **Dependable stability.** Unaffected by surges, or changes in air pressure.
4. **Linear, direct reading scale.** Not a "go" and "no go" gage. Positively controlled accuracy permits calibrated linear scale having graduations of **known value.**
5. **Longer range per magnification** .003" and .0015", on 2,500 to 1 and 5,000 to 1 respectively, takes care of 90% of gaging requirements and provides the following advantages:
   Greater Plug Clearance.
   Longer approach range.
   Longer gage head wear.
   Greater jet protection.
6. **Fast, easy setting.** Positive setting in ten seconds.
7. **Easiest to install.** Connect directly to air supply. Filter already attached. Pressure regulator assures ample protection — only 40 lbs. pressure required.
8. **Less maintenance.** Gage system better protected. Larger jets stay clean. Maintenance negligible if properly installed.
9. **Easily adaptable to special requirements.** May be combined with electrical and electronic units for **automatic gaging and machine control.**

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging

Federal's solution to the cost of gaging:
Impartial Gage Selection
Engineering Follow-Through
Everything In Gages

mail coupon today

Federal Products Corporation
6447 Eddy Street, Providence 1, R. I.

We'd like to test a Dimensionair in our plant.

Company Name.....

Your Name.....

Title.....

Address.....

Circle No. 1A on postpaid card

Here's the ONE outstanding wheel... for EVERY toolroom surface grinder

The Norton G BOND-32 ALUNDUM combination is unequalled for speed, versatility and economy*

THE FAMOUS NORTON G BOND holds each abrasive grain just long enough for maximum cutting action, assuring a constant grinding surface of fresh, sharp cutting edges. With 32 ALUNDUM abrasive it makes a great "Touch of Gold" team for grinding high speed and alloy steels. For other applications investigate Norton 38 ALUNDUM or 19 ALUNDUM abrasive. And remember, only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost.

The Norton G Bond is the most efficient vitrified bond ever developed for precision and semi-precision grinding. Wheels made with it bring you these valuable advantages:

Cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . easier dressing and more pieces per dressing . . . more work, and more kinds of work, per wheel.

Norton 32 ALUNDUM abrasive is another big advancement in grinding progress. It grinds exceptionally cool and fast, with minimum dressing, and is ideal for surface grinding jobs requiring fast stock removal and heavy feeds.

See Your Norton Distributor

for further facts on how the G Bond and 32 ALUNDUM abrasive add the "Touch of Gold" that saves time and money and improves product quality. Or write to the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1715

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Get Top Performance From These Grinders with G BOND-32 ALUNDUM Wheels

Brown and Sharpe • Crystal Lake • Delta • Doall
Gallmeyer and Livingston • LaSalle • Norton
Reid • Sanford • Taft-Peirce and many others

NORTON
ABRASIVES
Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Behr-cat Tapes

Circle No. 2A on postpaid card

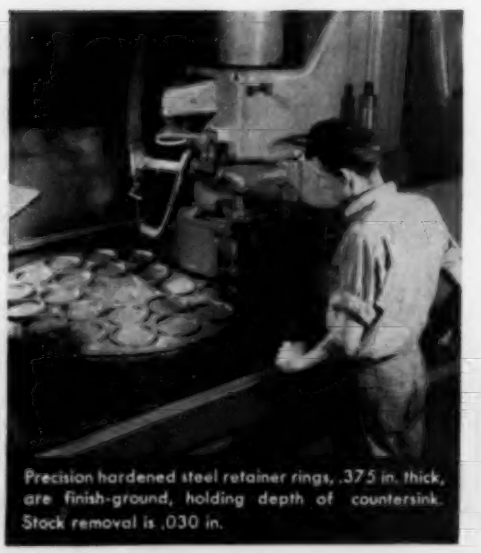
MATTISON
HIGH-POWERED
PRECISION

GRINDING METHODS

CASE HISTORY NO. 23—LARGE MEEHANITE CLUTCH PLATES

Courtesy:
Chicago Grinding & Machine Co., Inc.

How Mattison "Power-Designed" Vertical Rotaries are grinding more, different jobs faster!



Precision hardened steel retainer rings, .375 in. thick, are finish-ground, holding depth of countersink. Stock removal is .030 in.

"Power-designed" Mattison Verticals have *extra* horsepower, *extra* rigidity, and *extra* features to speed your jobs, and control your costs!

These operations at Chicago Grinding & Machine Co., Inc., Chicago, Ill., show the wide range of work you can do on a Mattison because of these important "extras." At the top, Meehanite clutch plates are finish-ground in 20 minutes each, holding size within .002 in. The plates, 43 in. in diameter, have a 12½ in. friction surface. For accuracy, the grinding wheel must be set *perfectly flat*. Powered by a 60 hp spindle motor, the Mattison "No. 36" removes .020 in. stock and maintains high unit pressures for free-cutting action.

At the left, the Mattison "No. 36" grinds two sides of retainer rings at the rate of 100 per hour, holding size to plus .000 minus .003 in. High power and rigidity permit grinding this job with only a slight wheel tilt for maximum accuracy.

Now available with automatic cycling and continuous feed—with a brand-new, heavier base—Mattison Vertical Rotaries give you greater accuracy and productivity, for a wider range of work. Ask your Mattison machinery dealer for complete facts.

MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.

HIGH-POWERED
PRECISION
SURFACE
GRINDERS

Circle No. 3A on postpaid card

The Editor's Page

The Splendid Advance

Philosophers and psychologists tell us that homo sapien is slow to change and once he is in a rut is as happy as a mole and nothing short of an earthquake will pry him loose. Now, philosophers and psychologists are very smart indeed; they study long and hard, meditate profoundly and weigh their words precisely.

Being just a confused editor I may be forgiven if I question this man-in-the- rut philosophy. As I compare 1956 with 1856, a split second of time in the history of our planet, I am stunned by the progress this mole in the rut has made, and by the advances he continues to make year after year. Each profession, each endeavor has resulted in a step forward. An advance in one profession sets up a chain reaction in another; thus, there is an unending undulating movement forward.

The grinding industry has not stood still. In fact, some phases of our technical progress would be impossible without the progressive thinking of our wheel, machine and accessory manufacturers.

In the field of automatic sizing, whether mechanical or electronic, progress has been distinctive. Automatic sizing devices are not limited to special equipment but can be used on a large variety of small standard machines.

Automatic truing, or dressing, of the wheel is much in evidence.

Small surface grinders are on the market on which the spindle speeds are automatically regulated as the wheel wear takes place.

The wheel manufacturers have wheels that'll grind everything from soft cheese to the hardest wonder metals; furthermore, wheels are safer (with proper use) and there is a wide selection for any type of grinding or polishing operation.

The machine builders have not been lax: greater rigidity, more beef, better and more precise components and ingenious applications of standard machines for special work into which automatic loading and unloading devices, automatic sizing and dressing devices have been incorporated, have found their way into production lines.

It all adds up to gratifying progress for the little man-in-the-rut who can look upon thousands of creature comforts undreamed of 100 years ago. It has been a splendid advance.

Wm. J. Schleicher

Editor

You're gonna be nuts about...

ABRASIVE
ACCURACY BOOSTS PRODUCTION

7" 1 HP — $1950.00

12" 2 HP — $1985.00

.....the entirely NEW

ABRASIVE *six eighteen*

hand feed precision surface grinder!

Everyone else in your company will, too! The new Abrasive Six Eighteen combines new size (6" x 18") and modern design with new Abrasive-engineered operational features.

Our new illustrated catalog tells all . . . all about Abrasive's effortless anti-friction roller ways; totally enclosed motorized spindle; new, chatterless cable table drive (successfully tested for over 1,000,000 quick reversals); convenient, waist high table and elevating hand wheels; deep, heavily-ribbed saddle; optional 12" or 7" wheel head; and how you can have the elevating and table hand wheels on either right or left.

Yours Free!

ABRASIVE

Machine Tool Company

East Providence 14, Rhode Island

Circle No. 215 on postpaid card

PRECISION PETE SAYS:

Only Thompson Type 2F Grinder has all three available . . .

1 COOLANT THRU THE WHEEL . . .

2 . . . COOLANT EXTERNALLY ON THE WORK . . .

3 . . . AND "IN POSITION" WHEEL TRUING

Thompson Type 2F
8" x 10" x 24" surface grinder

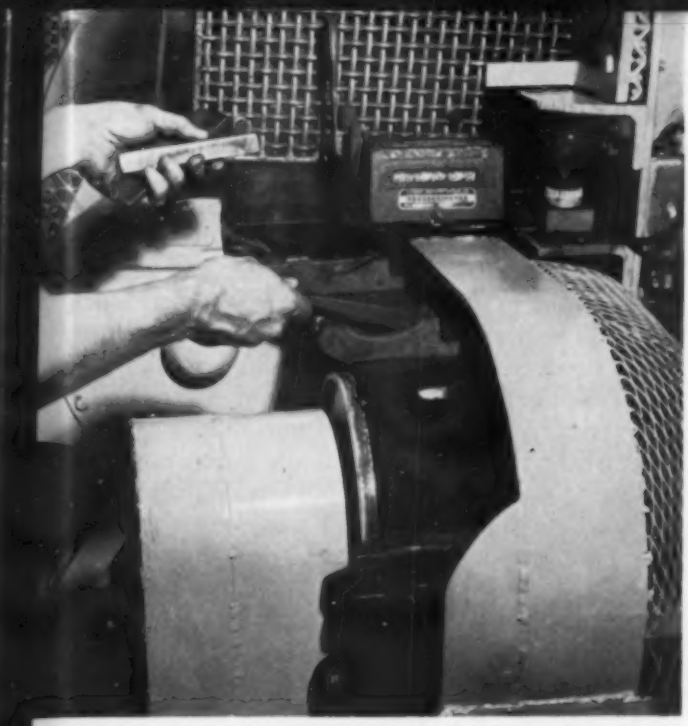
MANUFACTURERS
OF THE WORLD'S
MOST COMPLETE LINE
OF SURFACE GRINDERS

WRITE TODAY FOR DESCRIPTIVE DATA

THE THOMPSO
SPRI

Thompson
SURFACE
Grinders

Copyright 1956 The Thompson Grinder Company



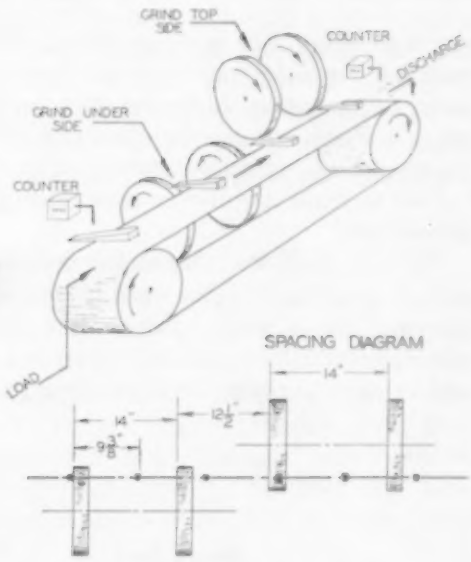
WEDGES ARE DISCHARGED from their holders by a hardened, tapered guide which tilts the wedge while the holder unit passes down around the conveyor wheel.

EACH PIECE IS INSPECTED for slag, misshape and burning scars as it is placed in holder.

NEW HOLDING DEVICE ON GRINDING MACHINE ASSURES . . .

Safe, Chisel-Type Production Grinding

- A straight-through operation, wedges are placed in holders fastened to belt
- Wedges move past 4 grinding wheels
- Grind is away from work; no goggles
- Labor and material savings: $12,000 first year



BASIC DESIGN of the wedge grinding machine.

By **David W. Kinney,** Plant Engineer
Union Insulating Co.
Parkersburg, W. Va.

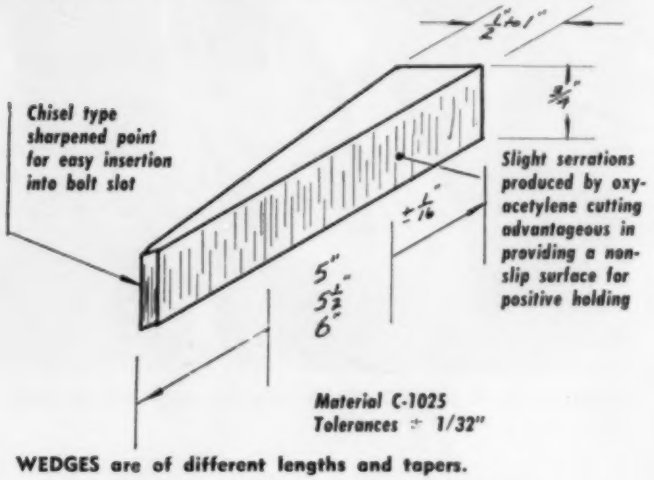
● A common and yet always difficult problem is production grinding of a chisel type point. Involved are fold-over, wheel breakdown, safety from accident; and uniformity, quality and cost. Our chisel point was on the business end of an expansion wedge used with a split-type roof anchor bolt in the mining industry.

The wedge is produced by alternately cutting right and left pie-shaped pieces from a flat bar using an oxy-acetylene flame. The slight serrations caused by cutting are advantageous in providing a non-slip surface for positive holding, but the heavy point was awkward to start into the bolt slot. Grinding a chisel point on the wedge made it easy to insert into the bolt slot and improved the appearance.

Specifically, the problem was to fabricate a machine which would bevel grind the ends of split bolt wedges to a chisel-shaped point. These wedges were of different specified lengths and tapers. The sizes range from 5" to 6" long, ¾" wide, ⅜" to 1" thick on the large end, tapering to 1/16" thick at the small end.

Sharpening the Wedge—The Old Way

The original method of sharpening the wedge was elementary. They were held against the side of a grinding wheel by an operator wearing gloves. Each operator sat in front of a wheel and managed to grind and inspect approximately 2200 pieces in eight hours. Pieces that had slag or were misformed were sorted out and returned to the barrel tumbler


Chisel type sharpened point for easy insertion into bolt slot
Slight serrations produced by oxy-acetylene cutting advantageous in providing a non-slip surface for positive holding
Material C-1025
Tolerances ± 1/32"

WEDGES are of different lengths and tapers.

or the scrap bin. The grinding wheels suffered severe wear on the sides and required dressing every 60 hours of operation. Moreover, our production was never uniform nor was the quality of the grind. The direction of the grind was parallel with the edge and tended to leave a roll-over burr after grinding the second side.

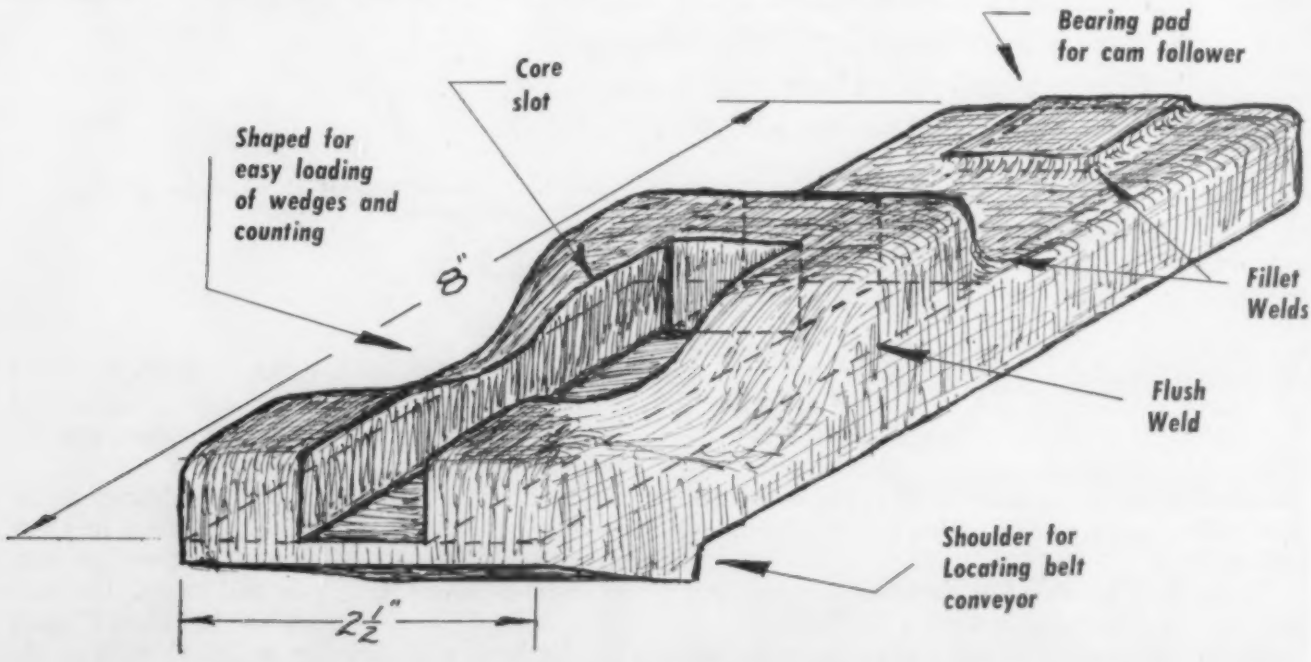
The job itself was distasteful and dangerous. A pair of grinding goggles worn by one operator was shattered by a wedge flung from the revolving wheel; several men suffered severe wheel "burns", and 14 medical claims from grinding particles in the eye were processed. Medical reports suggesting that grinding dust was causing lung difficulties indicated the imperative need for removal of air contamination due to grinding.

Our experience with consecutive operations on the same piece of material demonstrated that making the second operation faster than the first usually increased the production rate of the first by as much as 50%. The operator on the wedge cutting machine, which produced the wedges ready for grinding, was not working to the full capacity of his machine. Theoretically, the wedge cutting machine could make 6400 wedges per day; actually the operator was producing only 4250 wedges per day. With a grinding machine to pace him, 6175 wedges was assumed to be a fair production estimate. Calculating conservatively, a saving of 1½ cents per unit would amount to more than $10,000 in a normal year.

Design of the Wedge Grinding Machine

The basic design of the wedge grinding machine is a straight-through operation with the wedges being placed in holders fastened to a heavy, 8″-wide, rubberized, flat belt. The wedges move past four grinding wheels to the end of the conveyor where they are discharged. By having the direction of the grind away from the work, gouging of the wheel face is prevented. The wedges also pass the side of the wheel before making contact with the periphery to prevent breakdown of the wheel edge.

Only one wedge comes into contact with one of the grinding wheels at any given instant. This avoids excessive strain on the conveyor belt. Four wheels are required, two grinding one side of the wedge and two grinding the other. New wheel size is 12″ x 2″ x 1½″, and the wheels can be used down to minimum diameter of 9″. Each pair of wheels is



WEDGE HOLDER CASTINGS are attached to flat belt by countersinking flathead cap screws.

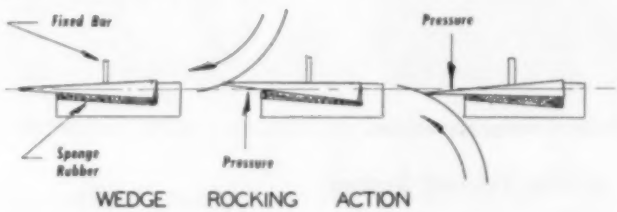
mounted on a common shaft so that they adjust together and use the same pulley drive.

A Reeves control device provides a maximum conveyor belt velocity of 278″/minute, a minimum of 160″/minute.

Holders Attached to Flat Belt

The wedge holder castings are attached to the flat belt by countersinking ⅜″ flathead cap screws and using special scalloped-edge washers similar to those found on inexpensive chair casters. To guide the assembly and compensate for the different lengths of wedges, the holders were designed to support standard ¾″ cam follower bearings. These operate between two adjustable steel guides and maintain the holder and the attached belt in proper alignment with the grinding wheels. Compensation for various wedge sizes is possible by shifting the guides toward or away from the grinding wheels, using adjusting handwheels.

A sponge rubber pad glued in the bottom of the holder absorbs the small tolerance variations of the pieces and permits rocking the wedge against the grinding wheel.



Wedge Rocks in Holder

A rigid bar fastened to the frame of the machine keeps the wedge nestled against the sponge rubber and prevents the action of the grinding wheels from pulling the wedge out of the holder.

To obtain proper grinding action, the wedge must rock in the holder. This is accomplished by using soft-rimmed pressure wheels which press the point of the wedge against a grinding wheel surface as the wedge goes by. The sponge rubber under the wedge makes this possible. (See above diagram.) The pressure wheels are not powered, but mounted on ball bearings and made sufficiently light so that the movement of the wedge turns the wheel.

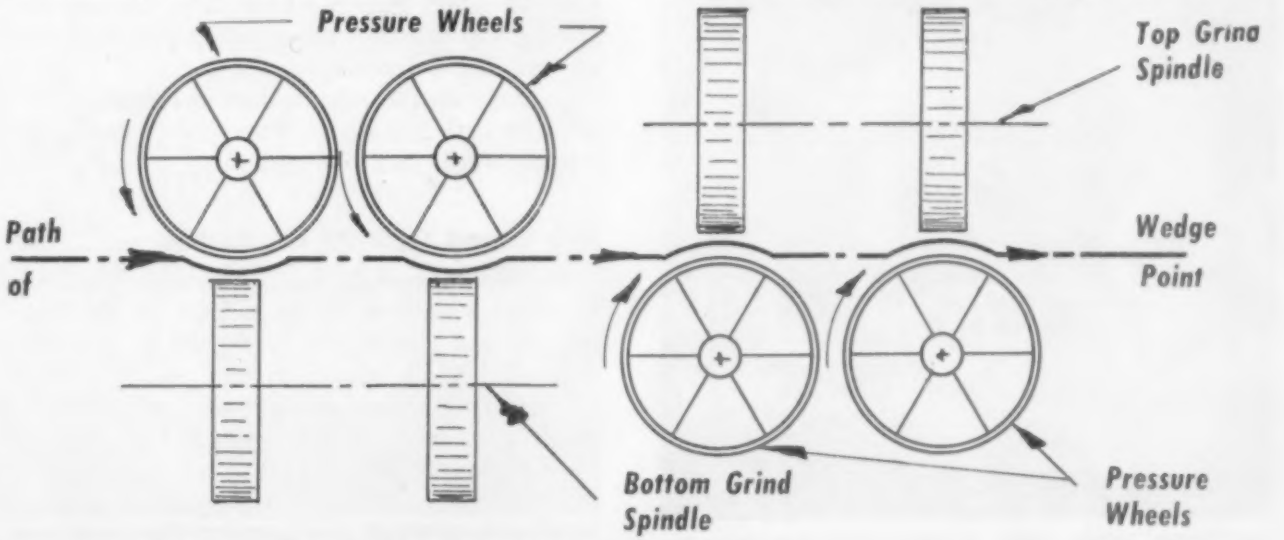
Grinding machines in general are subject to difficulties caused by the abrasive dust they create. This dust penetrates the smallest openings, adheres to all surfaces and causes galling and freezing of moving parts. To minimize the effects of the grinding dust, adjustments of the machine are made by rotary motion around a pivot point or by inserting or removing shim-type guides. All bearings are of the totally enclosed, double sealed variety wherever possible. All other wear surfaces are hardened and run dry.

Accurate Setting—Secure Anchoring

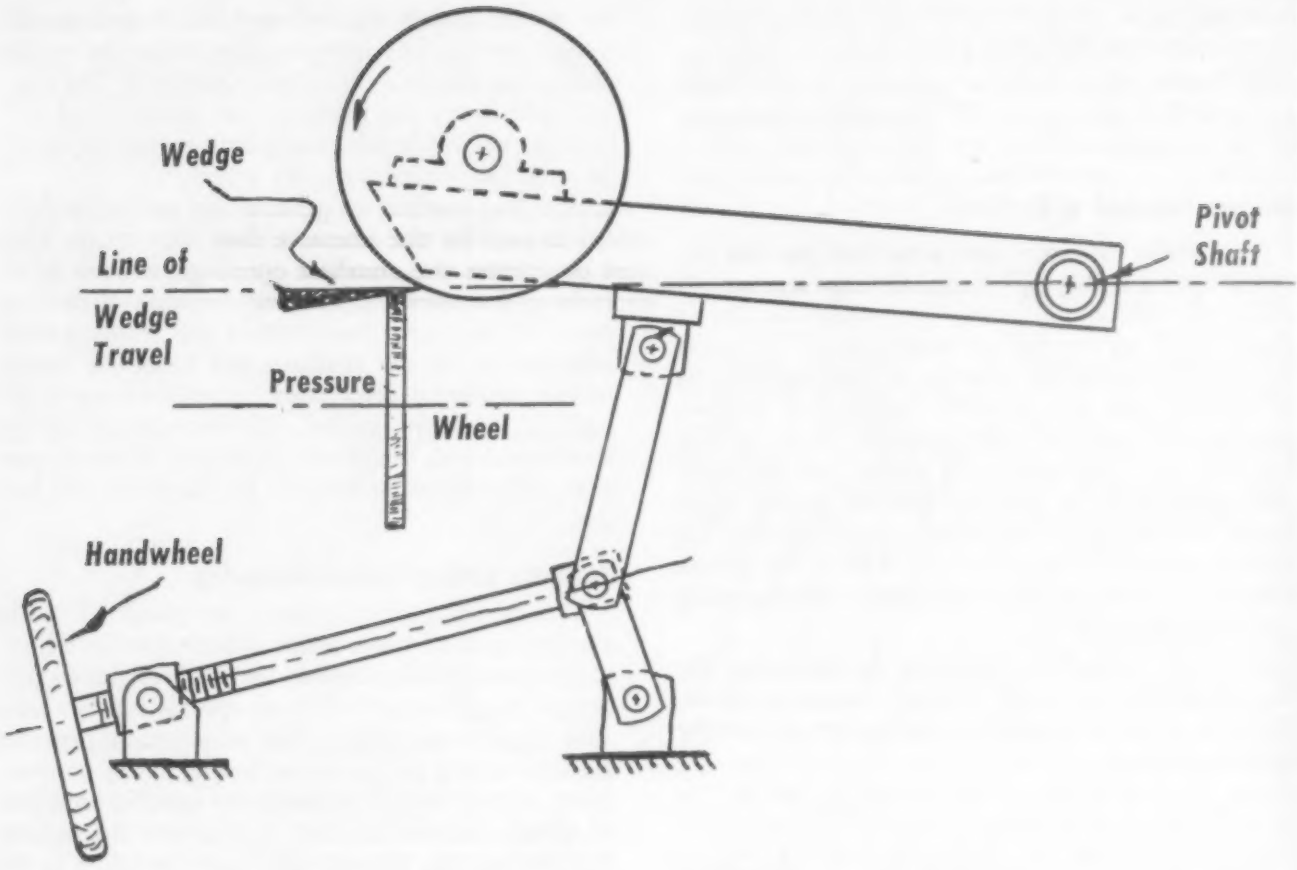
The grinding wheel spindles are mounted at the extreme end of pivot arms. Wheel spindle adjustments are controlled by two hand wheels, each operating a toggle connected to the spindle support arm. (See diagram next page.) This arrangement provides accurate setting and secure anchoring in any position. Since control is made through the spindle, each pair of wheels remains uniform in diameter throughout its grinding life. Considerable care was taken in the fit-up and machine work of the adjustment pieces, eliminating backlash that might plague this toggle-type construction.

Protection from Every Angle

The grinding machine is equipped with protection from every angle. This is accomplished by a combination of heavy wheel guards, ¼″ diameter heavy wire screen and ¼″ plexiglass panes. (See photograph.) The wire screen stops any flying fragments which might escape the steel wheel guards. Although heavy, this screening has been very satisfactory, because it provides fairly good vision while

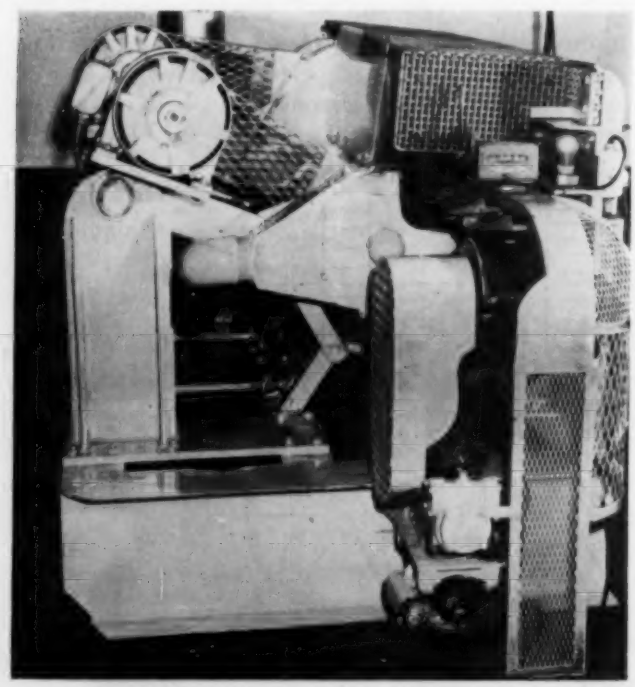


TOP GRINDING SUPPORT ARM showing travel and wheel adjustment toggle.



PRESSURE WHEELS are not powered. Mounted on ball bearings, movement of wedge turns them.

affording excellent protection from large pieces. The plexiglass eliminates any particles which are small enough to pass through the screen. There have been no injuries of any kind from the machine since it was first placed in operation.



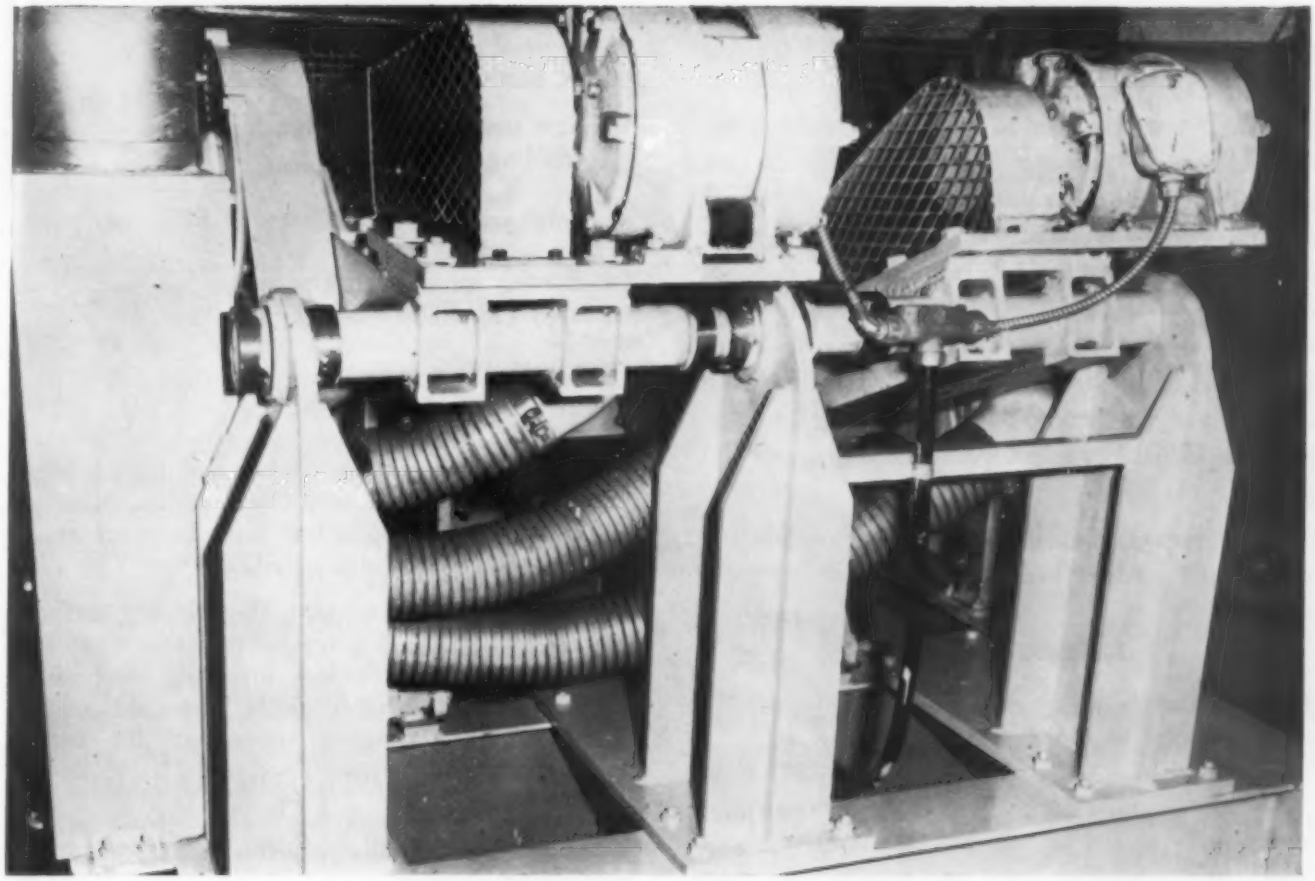
PROTECTED FROM EVERY ANGLE, grinding machine has heavy wheel guards, wire screen, plexiglass panes.

Suction Exhaust System

The control of grinding dust, always likely to cause allergic reactions and lung irritations, is achieved by a powerful suction exhaust system. The guard openings were made as small as operation would permit to help increase the air velocity into the exhaust duct. The individual wheel guards are connected to the main suction duct by 4″ diameter flexible steel exhaust hoses. (See photograph.) The flexible feature is necessary to connect the fixed suction duct and the wheel guards which move up and down during adjustment of the grinding wheels. A clean-out opening is provided at the bottom of a six-foot vertical rise in the exhaust duct to remove collected particles and provide an inspection opening inside the ductwork. (See photograph.)

How Wedges Come Off the Machine

The handling of the wedges from our plant to the customer is done in burlap sacks, each holding 100 wedges and closed with wire twisted around the neck of the sack. A counter with electrical contacts on the dial numbers was placed at one end of the machine in series with an electric light bulb. The light flashes on each time the last two digits read 00. (See photograph.) Thus the counter provides a total reading, while also signaling the operator each time 100 pieces have passed. At the discharge end of

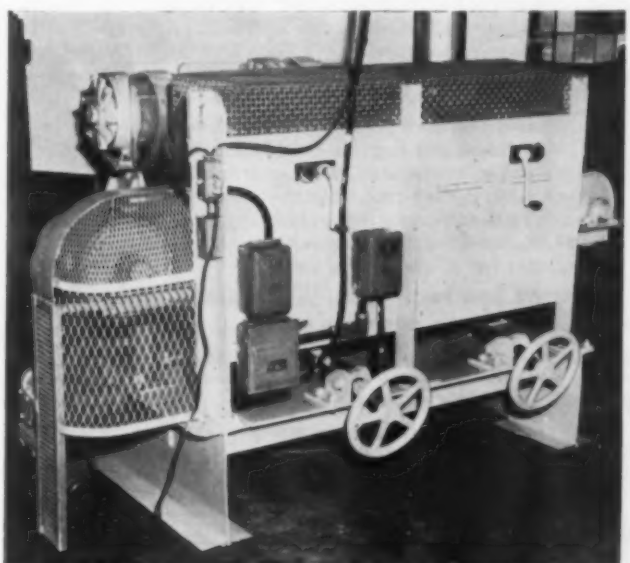


INDIVIDUAL WHEEL GUARDS are connected to main suction duct by 4-inch diameter flexible steel exhaust hoses.

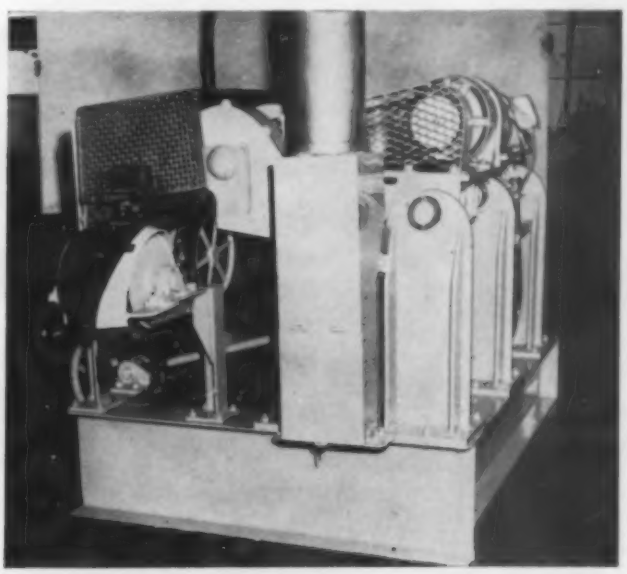
the machine, another counter also indicates the total number of wedges. The two counters furnish a double check on the count and an immediate warning if one counter gets out of order.

The wedges are discharged from their holders by a hardened, tapered guide which tilts the wedge while the holder unit passes down around the conveyor wheel. (See photograph, first page.) The wedge sack is slipped around a short length of heavy gage stove piping having a funnel-shaped top. The funnel is then set in a position to catch the wedges as they fall loose from the holders.

The work cycle of the operator provides several different actions and postures. This helps to eliminate fatigue and boredom. To obtain the wedges, the operator shovels them from a bin to his work table.



CLEAN OUT OPENING is provided at the bottom of a six-foot vertical rise in the exhaust duct to remove collected particles.



ANOTHER VIEW OF OPENING, which provides an inspection opening inside the ductwork.

While feeding the wedges into the machine, the operator sits on a high stool with several footrest heights. Each piece is inspected for slag, misshape and severe burning scars as it is being placed in the holder. (See photograph, first page.) Rejects are tossed directly into the tumbling machine conveyor nearby, or to a scrap bin. When the light flashes on, indicating 100 wedges, he walks to the discharge end of the machine, checks his count, ties the sack, moves it to a pallet and places an empty sack over the funnel, ready for more wedges. The shoveling occurs about once every 200 to 300 wedges, so that hard physical labor is complemented by easy hand work.

Total production during a typical six-month period was 389,000 wedges.

SAVINGS ANALYSIS:

Labor cost of grinding, counting and sacking wedges before machine:	**$ .0074**	**per piece**
After machine:	**.00205**	**per piece**
Labor savings:	**$ .00535**	**per piece**

Total cost of wedge, including material cost and overhead, old method:	**$ .0471**	
New method with wedge grinding machine:	**.0314**	
Total savings	**$ .0157**	**per piece**

Total saving for six-month period:
(.0157) (389,000) = $6100.

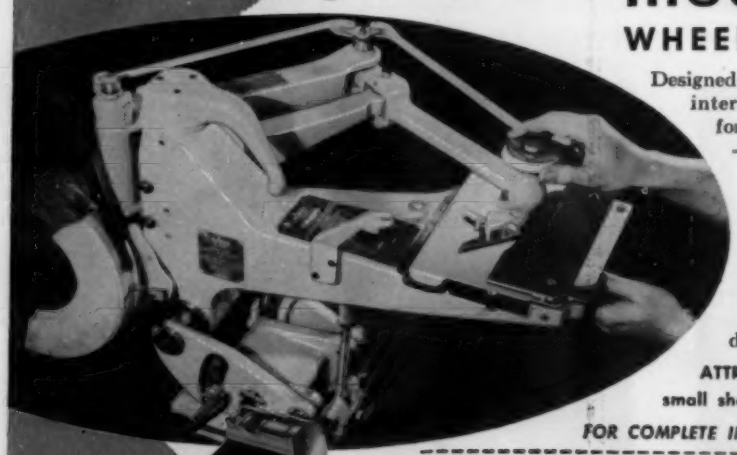
Total annual saving based on above: $12,000.

The performance of the wedge grinding machine has been entirely satisfactory. Good quality, uniformity and improved production have been achieved. Accidents have been eliminated.

To the author's knowledge, the gripping method used in this machine is unique and may have applications in other situations involving mechanical handling of wedge-shaped pieces. The ability of the holders and mountings to compensate for wedge irregularities, both in length and taper, has exceeded expectations.

The machine actually paid for itself in 4 months of operation. • • •

NOW! SAVE HOURS CYLINDRICAL FORM GRINDING using the NEW PRATT & WHITNEY model 10 diaform WHEEL FORMING ATTACHMENT

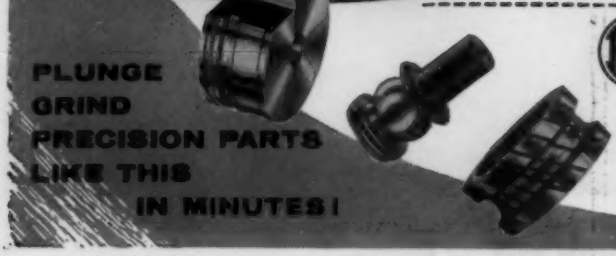


Designed particularly for use on universal, external and internal, cylindrical grinders, the Model 10 Diaform form-trues grinding wheels – ACCURATE TO TENTHS – in minutes. You'll save HOURS of work performed by your highly trained, highly paid employees.

Mounted on the machine table, the Model 10 is out of the way during grinding, but quickly available for truing or re-truing. In operation, a tracer is lightly traversed over an easily-made template; path of tracer is transmitted at a 5:1 reduction ratio to the chisel shaped truing diamond which dresses as it form-trues. Grinding wheels up to 14" diameter and 2" wide can be formed.

ATTRACTIVE, LOW PRICE! Quickly pays for itself in large or small shops. NOW AVAILABLE FROM STOCK!

FOR COMPLETE INFORMATION, SEND NOW FOR CIRCULAR NO. 596



PLUNGE GRIND PRECISION PARTS LIKE THIS IN MINUTES!

PRATT & WHITNEY COMPANY
INCORPORATED
6 Charter Oak Boulevard, West Hartford 1, Connecticut

Please send my free copy of P&W Circular No. 596.

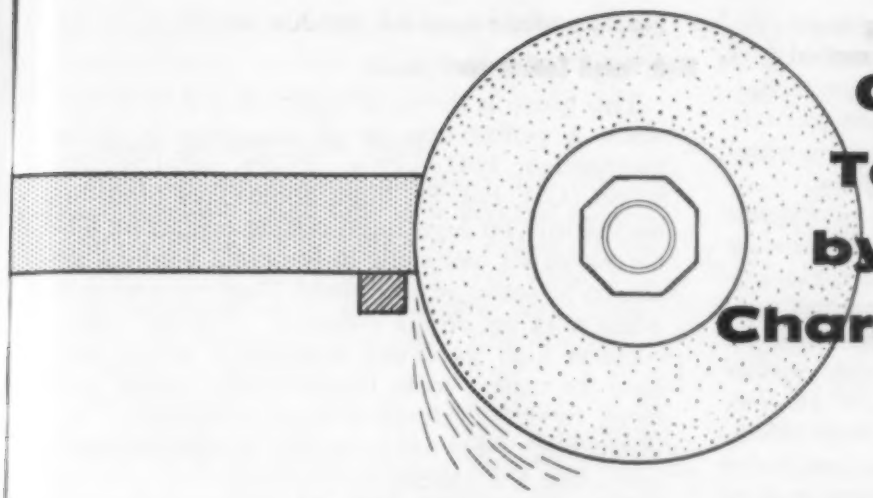
NAME _____ POSITION _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE _____ STATE _____

Circle No. 217 on postpaid card



Classifying Tool Steels by Grinding Characteristics

The many variables in the steels and the conditions under which they are ground will have effects that might materially alter the correct choice of an abrasive wheel.

By **J. A. Weir**
Abrasive Engineer
Bonded Abrasives Division
The Carborundum Company
Niagara Falls, New York

● Although steel consists basically of purified iron, many other metals—singly or in combination—are added to this base to provide the numerous varieties of steel and alloys of steel. The main additives are: copper (Cu), chromium (Cr), cobalt (Co), molybdenum (Mo), manganese (Mg), nickel (Ni), silicon (Si), tungsten (W) and vanadium (V). There are many combinations of the above metals on the market—some 2000 are listed under various names and manufacturers' trade names. Each of these combinations has its own specific purpose and use. With this array of combinations there are probably many duplicates, but each has a different alloy trade name to distinguish it. To simplify this long and complex list of alloys, they are classified into six groups, namely—

1. Air Hardening Steels
2. Hot Work Steels
3. High Speed Steels
4. Oil Hardening Steels
5. Shock Resisting Steels
6. Water Hardening Steels

All steels in the six groups are machinable in their soft state—some more easily than others. Milling, planing, broaching, stamping, rolling, cutting and many other methods are used to create the required shapes and dimensions from steels in their soft state. However, after a steel has been heat treated and hardened, the standard method for changing its shape and producing the desired surface finish is by grinding. This treatment deals with each group separately and discusses the peculiar characteristics encountered in each, relative to the grinding operation. Recommendations of abrasive wheel specifications for each grinding application are suggested. Each abrasive manufacturer has his own trade marked products. The data used in this article is based on laboratory and field tests of abrasive wheels.

1. Air Hardening Tool Steels

A typical steel in this group is of the following composition: 1.5C, 11.5Cr, .2V, .8Mo, Bal. Fe. The slow cooling in the hardening process of this steel causes less strain and distortion and makes it highly resistant to wear in use. This steel is chiefly used where it contacts or rubs other metals such as blanking dies, forming dies, rolls, cams, gages and many others. Of all hardened tool steels, this group probably gives the least resistance to grinding. Its particular characteristics and properties lend very well to metal removal by an abrasive grinding wheel.

As a large percentage of Air Hardening Tool Steels is used for forming and blanking dies, most of the grinding would be flat or form surfacing. For this operation a typical reciprocating table surface grinding machine is used—the grinding wheel size usually 7x½x1¼. For some machines on larger work, the wheel size may be 12x2x5 or 20x3x8.

The amount of surface contact of wheel against steel does affect wheel grading. The general rule to follow in these cases is—the larger the area of contact, the softer the wheel should be. For greatest wheel efficiency of course, the hardest wheel that can be used to do the job without burn and chatter

is the best wheel to use. Rather than trying to determine the proper wheel by the hit-and-miss method of testing many different grades, calling on the advice of an experienced Abrasive Engineer will save time and money in arriving at the best abrasive wheel specification for any job and condition.

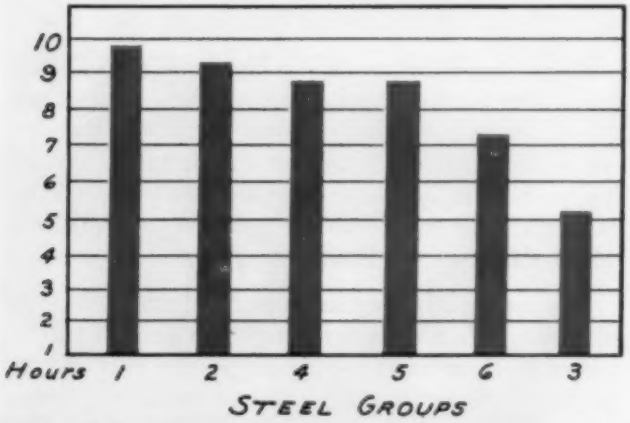
Exhaustive tests in the Grinding Laboratory, and extensive field trials have proved the following grading to be most effective in grinding Air Hardening Steel Tools: For average stock removal and commercial finish—AA46-H8-V40; for faster stock removal—AA36-H8-V40; and for smoother surface finish—the wheel grading would be AA60-H8-V40. These wheel gradings are typical starting recommendations which may be varied one or two grades in hardness depending on job conditions such as wheel periphery speed, amount of infeed, traverse speed, wet or dry grinding and others.

2. Hot Work Tool Steels

Hot Work Tool Steels may be typified by the composition: .35C, 5.0Cr, 1.5 Mo, 4Mn, 1.25W, 1.0Si, Bal. Fe.

Hot Work Steels, as the name would indicate, are used in operations where material being worked is usually in a temperature range from 1000°F to 2000°F. Typical operations on this type are: hot forging, hot shearing, extruding, coining and heading. The primary requirement of this steel is to maintain its hardness under conditions encountered in the temperature range mentioned above, and also maintain its ability to withstand shock and extreme pressures. To accomplish this the carbon content is kept lower than in most other steels—just enough is maintained to insure necessary hardness.

These steels are generally classed as high chromium or tungsten types. Both these types are high in grindability qualities, and for surfacing operations on a grinding machine, the same wheel gradings would be applied. For average stock removal and finish, AA46-H8-V40 is recommended; for faster stock removal AA36-H8-V40; and for smoother finish, AA60-H8-V40. The wheel life and action should be very similar to Air Hardening Tool Steels (Group No. 1) and the same job variables would apply.



AVERAGE WHEEL LIFE RATIO in hours on identical applications.

3. High Speed Tool Steels

This group is the most highly alloyed of all tool steels. A perfect example of this group is of the composition: HiC, 3.75Cr, 125-2W, .075-1.5V, 7.5-9.5Mo (Co), Bal. Fe. High Speed Tool Steels are used chiefly for high speed cutting operations. The hardest of all tool steels in Rockwell hardness are also to be found in this group. High temperatures, when working, do not noticeably affect the cutting edges of high speed tool steels which makes them ideal for cutting tools. Consequently, cutting tools of all types fall, almost without exception, in this group. High speed tool steels have no equal for speed drills, taps and cutters.

There are many grades of high speed steels, but they can be classified into two broad types—tungsten type or molybdenum type—which are referred to as "general purpose" high speed steels. Others considered as "special" high speed types are of high vanadium and cobalt content.

The average starting wheel gradings for the "general purpose" types would be in finer grit than for Groups 1 and 2, and much higher wheel wear should be expected. The characteristics of this group give it a very low grindability, and the resistance to abrasion by grinding is highest. For average stock removal and finish, the wheel grading recommended is AA60-H8-V40; for faster stock removal—AA46-H8-V40; and for smoother finish—AA80-H8-V40.

For special types of high speed steel or high vanadium or cobalt, a different problem is presented to abrasion by grinding. These two types, such as Rex 3V and Rex 4V, contain a larger number of hard vanadium carbides, and are the hardest of steels available. Exhaustive tests have found the two most efficient methods of grinding the special types of high speed steel are as follows: with regular speed machines, a softer grade wheel must be used—AA60-G8-V40 and AA80-G8-V40, depending on finish required. For faster stock removal, an AA46-G8-V40 should be used. Another very effective method has been found to grind these types of steel—using a harder grade wheel such as AA60-L8-V40 or AA80-L8-V40, and slowing wheel periphery speed down to 3100 SFPM. By either method, this material can be efficiently ground, but higher wheel wear should be expected here, as in the "general purpose" types.

4. Oil Hardening Tool Steels

The following composition: 0.80C, 0.25Si, 1.1-1.3Mn, 0.6Cr, 0.4W, Bal. Fe, is representative of this group. Oil Hardening Tool Steel has the qualities of hardening all the way through by oil quenching, which makes it an ideal material for blanking dies of intricate shapes, coining dies and draw dies. This group has high grindability and presents no problems to abrasion by grinding. A starting recommendation for surfacing would be AA46-H8-V40

for average stock removal and finish; for faster stock removal would be AA36-H8-V40. For better finish, AA60-H8-V40 is recommended.

5. Shock Resisting Tool Steels

Many tool applications require a steel that can stand excessive shock. One such steel has the composition 0.50C, 2.75W, 1.25Cr, 0.25V, Bal. Fe. One of the group of Shock Resisting Tool Steels, it has the properties which are ideal for such uses as hydraulic chisels, hammers, drop forge hammers, anvils, die holders and others.

While this steel is in the hard range—usually around Rockwell C60, it has a high grindability quality. The resistance to grinding is low and makes it an ideal material for shock resisting applications.

For average surfacing applications, the grinding wheel starting recommendation would be AA46-H8-V40 for average stock removal and finish. For faster stock removal, AA36-H8-V40, and for better finish, AA60-H8-V40. As in the other groups, different types of grinders and other variables would affect the choice of wheel grading. Maximum wheel life can be expected when grinding this steel with proper wheel grading.

6. Water Hardening Steels

In this group, commonly called "case hardening steel," a typical composition would be: 1.1C, 0.2Cr, Bal. Fe. It has the quality of hardening on the outside shell. This leaves the center or core in a softer state—but it is tough, which provides a base for the case. This steel, as in all other groups, has a very definite purpose. Its particular characteristics lend very well to tools such as die blocks, cold chisels, wood chisels, knives, tin snips, razors and others. Water Hardening Steels have a medium grindability quality and give only a minimum resistance to abrasion by grinding. For average stock removal and finish, AA46-H8-V40; for faster stock removal, AA36-H8-V40; and for smoother finish, AA60-H8-V40.

Summary

In summarizing the six groups of steel and their grinding characteristics, it should be noted that four groups—namely, 1, 2, 4 and 5 are high in grindability. One group, No. 6, could be classed as medium, while group No. 3 stands by itself as low grindability and will cause higher wheel wear.

It has been explained that many variables in the steels and the conditions under which they are ground will have effects that might materially alter the choice of grade of abrasive wheel. The recommended gradings, which appear for each group, have proved most satisfactory under normal grinding conditions. These gradings have been established by exhaustive tests in the Carborundum Grinding Laboratory and by extensive field trials. • • •

Group	Principal Uses	Grindability	Average Starting Recommendations for Surface Grinding	For Higher Surface Finish
No. 1 AIR HARDENING TOOL STEELS	Blanking Dies Forming Dies Rolls, Gages	HIGH (Wheel Wear Low)	AA36-H8-V40 AA46-H8-V40	AA60-H8-V40
No. 2 HOT WORK TOOL STEEL	Hot Forging Hot Shearing Extruding Dies	HIGH (Wheel Wear Low)	AA36-H8-V40 AA46-H8-V40	AA60-H8-V40
No. 3 HIGH SPEED TOOL STEELS	Cutting Tools Drills, Taps, Reamers	LOW (Wheel Wear High)	AA36-G8-V40 AA46-G8-V40	AA60-G8-V40
No. 4 OIL HARDENING TOOL STEELS	Draw Dies Coining Dies	HIGH (Wheel Wear Low)	AA36-H8-V40 AA46-H8-V40	AA60-H8-V40
No. 5 SHOCK RESISTING TOOL STEELS	Chisels, Anvils, Drop Forge Hammers	HIGH (Wheel Wear Low)	AA36-H8-V40 AA46-H8-V40	AA60-H8-V40
No. 6 WATER HARDENING TOOL STEELS	Wood Chisels Shears, Tin Snips	MEDIUM (Wheel Wear Med.)	AA36-H8-V40 AA46-H8-V40	AA60-H8-V40

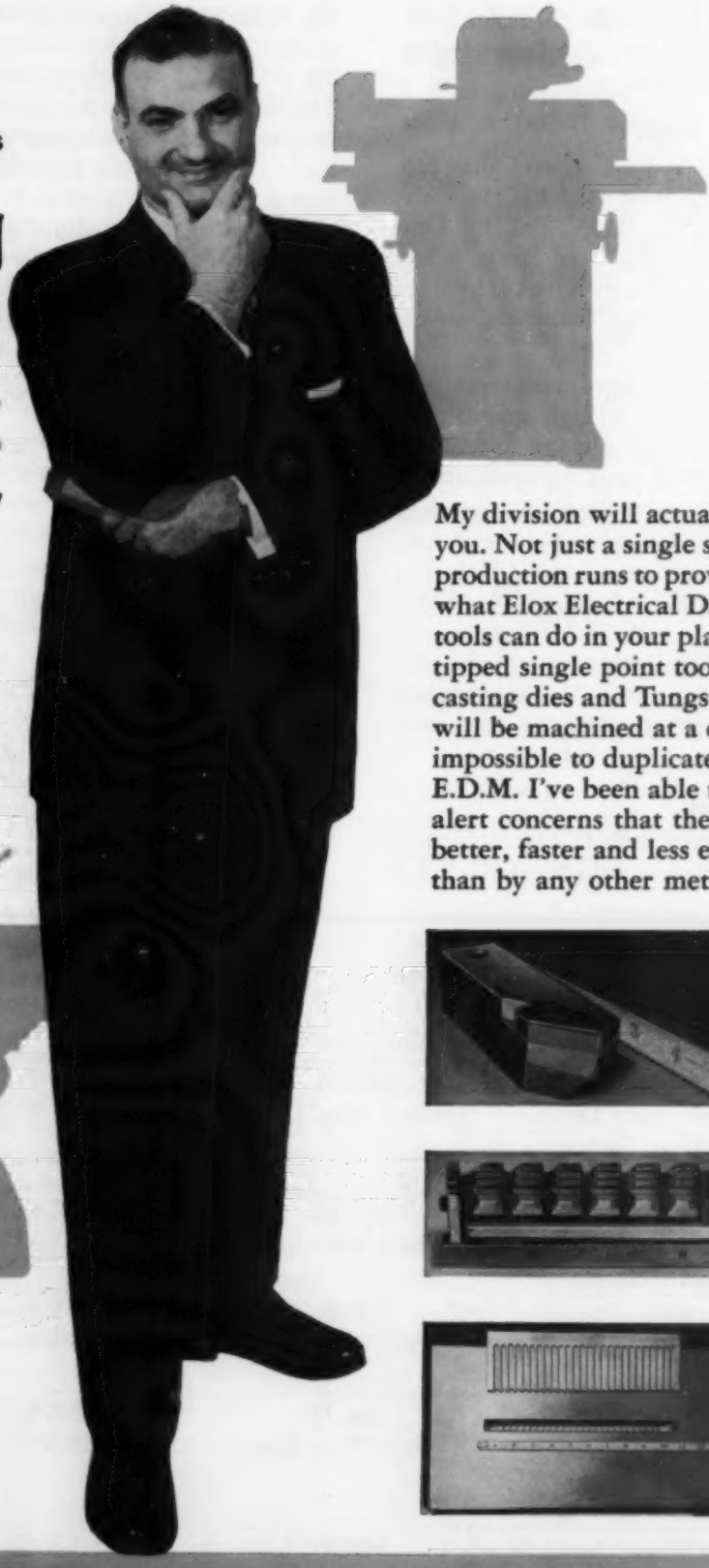
my name is

Ping Ianitelli

in charge of our

"Prove It"

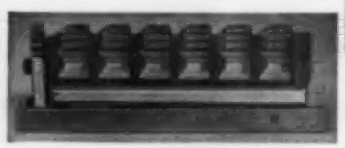
division at elox



My division will actually machine parts for you. Not just a single sample, but enough production runs to provide a true evaluation of what Elox Electrical Discharge Machine tools can do in your plant. Tungsten Carbide tipped single point tools, forging dies, die casting dies and Tungsten Carbide form tools will be machined at a cost we guarantee impossible to duplicate except with Elox E.D.M. I've been able to prove to hundreds of alert concerns that these jobs can be done better, faster and less expensively with Elox than by any other method.

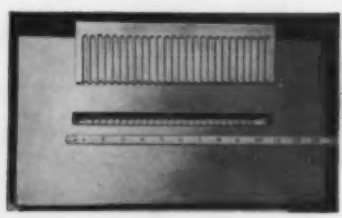
WE SAVED 19 MINUTES

grinding this single point tungsten carbide tip boring tool.



WE SAVED 16 HOURS

plus 9 different operations on this form grinding of a carbide broach.



WE SAVED 379 HOURS

on the machining of this die casting die.

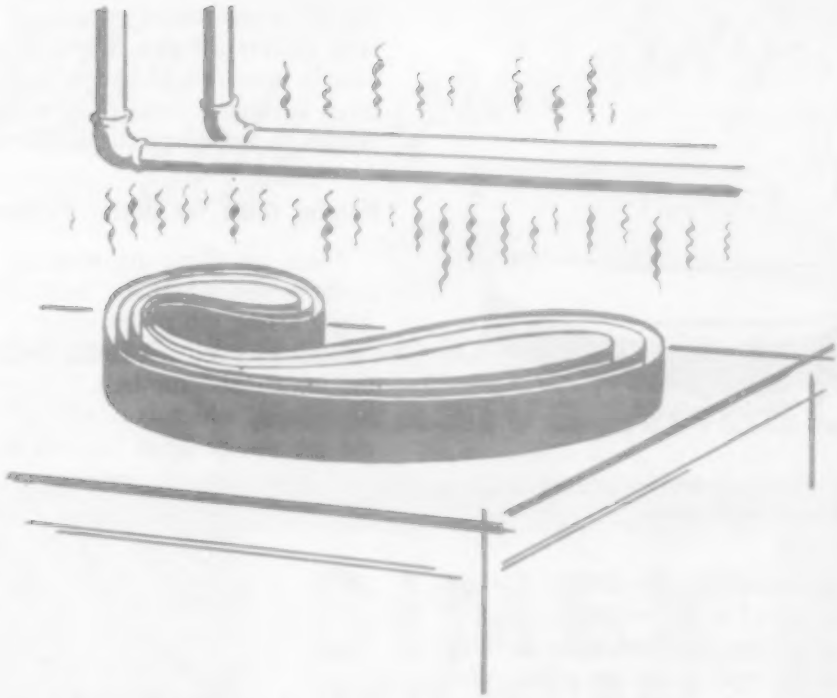
WHATEVER IT'S COSTING YOU NOW... CHECK WITH ELOX

elox corporation of michigan

1820 Stevenson Hwy.
Royal Oak 3, Michigan

*T.M. Reg.

Circle No. 218 on postpaid card



STEAM PIPES and other hot spots in the plant are deadly for the adhesives which bond abrasive to the backing of a belt.

Why Ruin Abrasive Belts?

Thoughtless maltreatment can reduce a valuable grinding and polishing tool to worthless junk

by **Louis W. Kemp**
Industrial Divisional Manager
Behr-Manning Co.
A Division of Norton Company
Troy, N.Y.

● Coated abrasive belts properly stored and properly used can take a lot of beating but, like most shop equipment except possibly an anvil, they have their points of vulnerability to downright abuse. There's little to be done, probably, about the employee with his mind on tonight's date or his current standing in the baseball pool. But for the operator who has been ruining good belts simply because he didn't know any better, a few words of caution may save waste and needless expense.

Improper Storage

First and most common type of abuse results from improper storage. Like the morning when an anguished polishing foreman telephoned a Behr-Manning branch, located a field engineer and yowled, "Your so-and-so belts keep bustin' before they get up to speed. Get out here, will ya, and this time bring some good ones!"

His mentor arrived, took a look at one of the belts, and asked, "Where do you store these, Joe?"

"Right up on top of that cabinet," was the answer.

Beware of Proximity to Steam Pipes

The belts were almost touching steam pipes which had thoroughly dried out the glue bond and made the belts as brittle as corn flakes. Abrasive grits are bonded to the paper or cloth belt with glue or synthetic resins, and either will give up the ghost in the presence of too much heat, cold or moisture. The ideal conditions are 70F, 35 to 50 per cent relative humidity. No one expects the belt user to set up controlled-atmosphere storage rooms for belts, because they're not that finicky, but do keep them away from heated equipment.

Don't Store the Belt In Freezing Temperature

Equally, don't store belts in unheated sheds in the winter, or leave them in a truck overnight. Once a belt has been allowed to freeze, it has had it. Too dry an atmosphere is no worse than one too damp. Watch for condensation dripping from pipes, for

EXPOSING BELTS TO FREEZING TEMPERATURES is one of the surer ways of making them worthless.

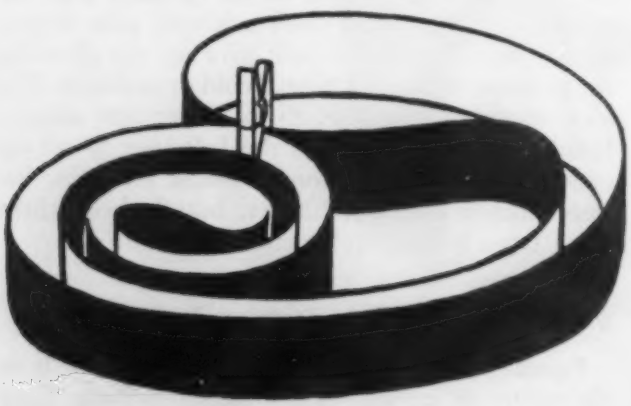
example. Not even waterproof belts used for wet grinding should be stored in a damp area; some of them have as many as three layers of water-repellent resin adhesive, and the outer layer can soften while the inner layers remain dry. In service, a belt so abused will delaminate.

Don't Hang on Nails or Hooks

A favorite way of converting new belts to scrap is to hang them on nails or hooks. If long and relatively heavy, or if many belts are suspended from a nail, the paper or cloth backing will be creased or even broken. Result: shutdowns, impassioned words, and more of the boss's money out the window.

How to Store Properly

Instead, store unused belts in coils, on edge and on a flat, clean surface. Spring-backed clothespins clamped over the outer two coils will keep the belt from unwinding. If space is lacking and you have to hang them up, drape them over a clean round gallon can, an old pulley, a brake drum or one of those grooved hangers for garden hose. Tossing a belt on a bench covered with iron filings and other bits of tramp metal means, of course, that it will later deliver a finish measurable in micro-feet—not exactly evocative of cheers from the quality control boys. Similarly, don't drop a belt in a puddle of oil and expect good performance.



PROPER STORAGE of coated abrasive belts calls for moderate temperature and humidity, as well as cleanliness. A simple clothespin will keep a belt from unwinding.

Helpful Hints for Better Performance

Then, too there are ways of throwing away belt dollars even when the belts are tracking true and doing a fine job of grinding or polishing. If you're polishing against a platen, leave a bit of air between the platen and the belt. Constant contact will heat the platen, which is usually all right until you shut the job down. Then the fun begins. The belt chars or, if the belt joint happens to stop on the platen, it will melt.

RUN IN THE WRONG DIRECTION, any coated abrasive belt will soon cease to be endless.

If you're on a wet-sanding job and you're going to shut the sander down for a half-hour or more, relieve the tension on the belt. Strong as belts are, they're not towing hawsers, and the tension set up as they dry and shrink will snap them.

Finally, take a quick look at the arrows on the back before you mount the belt. They aren't there for decoration, and a belt operated in the wrong direction makes a dandy foul-up as soon as the joint hits the work-piece. Of course, no competent operator needs to be told that simple rule, but you'd be surprised how often it's overlooked. Also, you can increase belt consumption and put a crimp in your own shop's profits if you'll do all your grinding at one spot, widthwise, on the belt. A four-in. belt grinds beautifully over its whole four inches of width —honest! Why not use it? • • •

For better safer grinding

SIMONDS ABRASIVE CO.

Reinforced Resinoid Bonded ABRASIVE WHEELS

SIMEX® RED WHEEL

Save time and money on weld grinding with SIMEX . . . lightweight, rigid, for heavy duty use. Structurally different—with auto tire cord safety web backing! Send for Bulletin ESA-244.

FIBREX® RED CENTER WHEELS

Ideal for deburring, finishing, polishing and cutting-off. Slightly flexible for general offhand use and the lighter weld grinding jobs. Extra strong and fast cutting. Send for Bulletin ESA-244.

XX DOUBLE XX CUT-OFF WHEELS

Glass fiber reinforced for extra strength, less breakage and long life
Fast cutting on all types of metals and non-metals.
Send for Bulletin ESA-243.

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities
Division of Simonds Saw and Steel Co., Fitchburg, Mass.

Circle No. 219 on postpaid card

TODAY'S CHALLENGE TO GRINDING MACHINE DESIGNERS:

Meet Growing Precision Production Demands

Since the introduction of centerless grinders and center type plunge grinders, exploitation of grinding parts at high rates with precise accuracy has steadily increased. The author discusses some of the requirements of accuracy, truing devices, gage sizing, special and standard grinding machines.

By **A. H. Dall,** Director
Standard Machine Tool Engineering
The Cincinnati Milling Machine Co.

● While great strides were being made in high production grinding, the precision grinding of parts to high finishes and accuracy was not being neglected. At this point, a discussion of some of the requirements of accuracy might be in order. These are in the order of their importance.

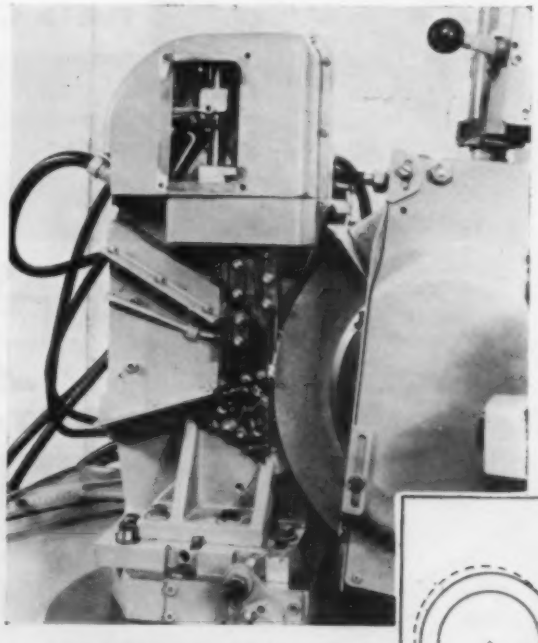
- Size
- Roundness
- Straightness
- Finish
- Waviness
- Concentricity

The problem of sizing has been with us for many years. Great strides have been made in this field, principally because of the accelerated development of instrumentation for measuring size. Twenty-five years ago, fractions of a thousand were usually designated in the jargon of the shop as "½ thou" or "¼ thou." Nowadays, these same dimensions will be alluded to as, "5 tenths" or "2½ tenths." Further, with the advent of the latest of size measuring instruments, electronic and mechanical, we often hear the shop man referring to a part being "25 millionths" over or under. The glib reference to millionths by the shop man causes a shudder to run down the spine of the grinding machine designer because he is now in the region where thermal stability is a major factor in his machines. The day is not far distant when size and temperature will have to be specified simultaneously.

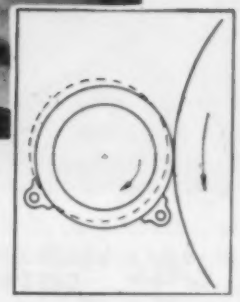
The same stringent requirements for roundness and straightness can be imposed because the instruments are available to measure them. Further, very accurate finish measurement devices have been on the market for many years. While the grinding machine is the determining factor to a large extent for the six requirements above, wheels in many cases can determine the fulfillment. If a wheel breaks down unevenly, roundness and waviness can be affected greatly, and every grinder man knows that wheels are a determining factor in surface finish.

With the introduction of instrumentation for measuring the above six accuracy factors, precision grinders were improved by necessity. As an example, the need for roundness and size in ball and roller bearing races is obvious. At one time, chucking methods were almost universally used. While the accuracies obtained were very good, the process of chucking introduces distortion.

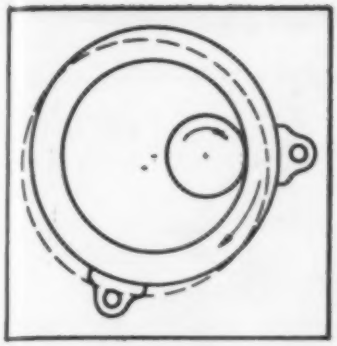
The invention of the microcentric method, illustrated in Fig. 2, made possible roundness accuracies on a production scale which were outstanding. In this method, the work is supported on shoes and is driven by an eccentric face driver which is assisted by the grinding force similar to centerless grinding.



1—MICROCENTRIC PRINCIPLE is employed in this grinding machine.



2—MICROCENTRIC GRINDING.



3—HOLE GRINDING with the centrimatic principle.

This method is truly generative. It can be shown mathematically, that the evolution from an out-of-roundness condition to a condition of roundness is extremely rapid and requires a minimum of stock removal.

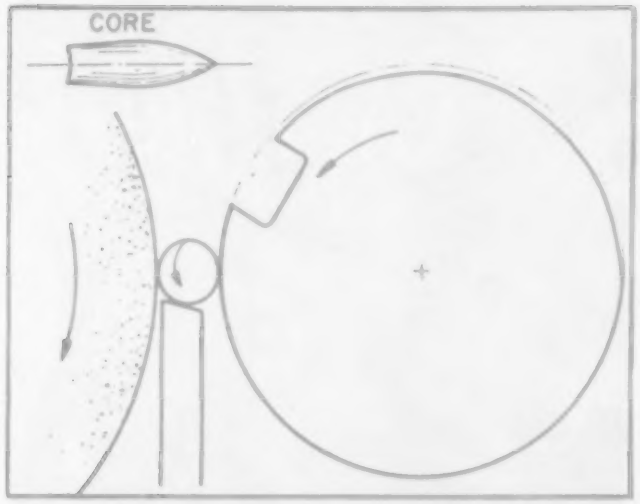
In Fig. 1 is shown a machine in which the micro-centric principle is employed. The shoes are adjustable for optimum set-up conditions. The driver is magnetic, providing the necessary torque to rotate the work and also providing a component of force to hold the work in close contact with the shoes. A vertical sliding work loader takes the workpieces from the upper chute, loads them in grinding position and ejects them through the lower chute. The loading is timed with the cycle so that the machine is fully automatic.

The size, of course, is a function of accurate wheel position. Waviness is minimized by the generative process. It must be pointed out that the face of the work is fully supported and distortions are at a minimum because the work is unclamped. Symmetry of force application causes the grinding force to have virtually no effect in distorting the piece. Fig. 3 shows that the grinding of the hole can be accomplished to provide dead concentricity and roundness.

Roundness in center type grinding is obtained when the centers in the workpiece (conical hole in the ends of the pieces) are well made with a good bearing on the machine centers. Further, it is necessary to spark out at the end of the grind or reduce the feed at that time to a very small value. (See gage grinding later.) Of course, the wheel must be true running or variation in roundness will result.

In sizing, the positioning of the wheel is essential. In center type grinding, variations in wheel positioning will cause a radius error equal to the variation; thus the diameter of the workpiece will vary twice the positioning error. In centerless grinding, positioning error is equal to the diametric error.

Further, the work support means (centers, chuck, etc.) must be rigid and purely elastic as possible. During the heavy grinding portion of the operation, the work support will deflect inevitably and the deflection must be recovered at the finish part of the cycle. Thus, both the wheel and work support must be separated by a constant dimension at the end of each cycle in order that size duplication can be obtained. To grind to within 0.0001-in. it is necessary



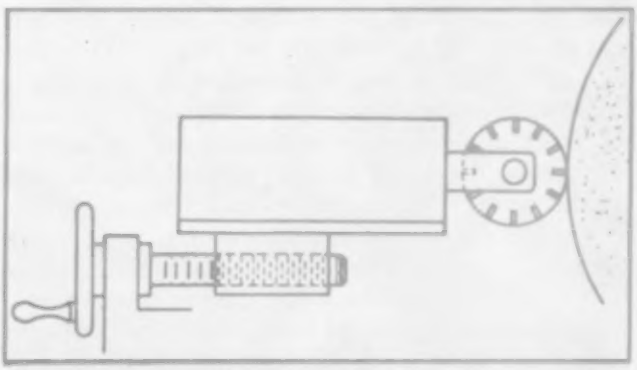
4—METHOD OF INFEED, using a cam regulating wheel.

that this cumulative error be 0.00005-in. or less.

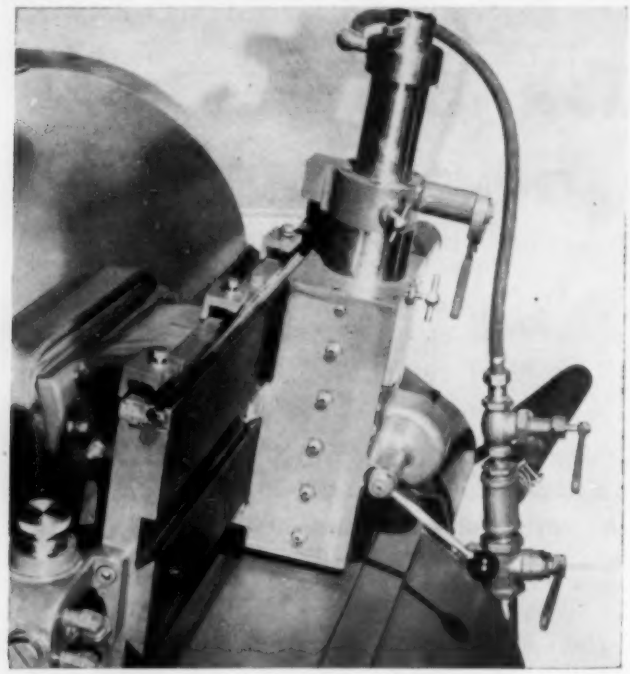
Much study has been given to this problem. The wheel slide bearings must be extremely precise. The method of moving the slide must be totally devoid of stick-slip. Various slide designs are currently in use, hydrostatic films and antifriction ball slides are being used with success. On the larger machines, carefully made, generous slides using boundary lubrication with special oils are being used successfully. The screw and nut usually are the means of moving the slides because of their inherent rigidity. Too much elasticity in these members will promote stick-slip.

On centerless grinding, a method of infeed was used extensively in World War II, particularly for the grinding of projectile cores for small caliber weapons. A schematic diagram of this method is shown in Fig. 4. In this method, the regulating wheel is cam shaped with a slot for work ejection. As the wheel rotates, the work is pushed toward the grinding wheel and a concentric part of the wheel determines the finished size; thus, on every revolution of the regulating wheel a part is produced. Projectile cores produced in this manner were accurate ballistically and with closely controlled shapes, their armour piercing capabilities were greatly increased.

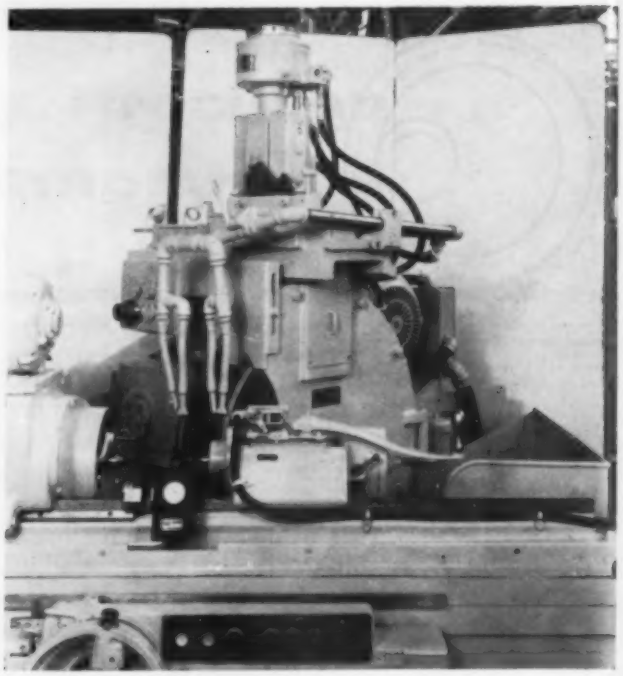
This method of grinding is peculiarly adaptable



5—CRUSH TRUING. Wheel is usually rotated at reduced speed when truing. Crushing tool, forced into contact with wheel, causes bond and grits to break away.



6—CENTERLESS TRUING ATTACHMENT. Rugged slide guides the diamond.



7—OVERHEAD TRUING DEVICE for cam operation.

to small parts and is now being employed extensively in the automotive industry.

Truing Devices

The armour piercing cores were ground to form. Form grinding has become a very important part of the total grinding operations now being performed in this country. In form grinding (which also includes step grinding), the wheel must be trued accurately to the form. In the case of the armour piercing cores, this was accomplished by diamond truing, using a cam to guide the diamond bar or slides.

While the diamond method is used extensively, another method has gained wide usage in the last five years. This method is known as crush truing shown in the schematic diagram of Fig. 5. The wheel is usually rotated at reduced speed when truing and the crushing tool is forced into contact with the wheel causing the bond and grits to break away.

The periphery of the crushing roll is formed to the requirements of the workpiece; helical slots are cut into the roll to accelerate the process. While the life of the truing roll is limited, it is surprisingly high when made of the proper material. The method of force application is important and techniques have been developed for the optimum application of this force.

One of the limitations of grinding as a means of metal removal is the wear of the wheel. This is a necessary evil, because when the wheel wears, new tools or abrasive grits are brought into use. Thus, in effect, we have a self-sharpening tool. While this wear may make the grinding wheel manufacturer happy, it is a never ending source of annoyance to the grinding machine designer. When wheels wear, size, as well as form and finish, will change unless compensations are made or the wheel is trued. The requirements of truing vary greatly from machine to machine. For this reason, it can be stated that more time is devoted to truing attachment design than any other feature of precision grinding machines.

The same truing attachment must be used to true a 20-in. wheel as the worn 14-in. wheel. The diamond bar must reach out the additional 3-in. and still remain rigid, because, if the diamond holder vibrates while truing, so-called spiral marks will be produced in the work. The diamond bar traverses across the wheel while moving in and out accurately to create forms.

All this has to be done in the presence of a copious supply of water mixed with grit, an ideal lapping mixture. However, great strides have been made in truing in recent years. Truing attachments are now available for automatically truing the wheel at predetermined intervals. One bearing manufacturer trues wheels every fourth piece in order to preserve accuracy. In this operation, the truing is automatic and the machine compensates for the reduced wheel size. With automatic loading of the parts, the machine requires little operator attention.

In Figs. 6 and 7 are illustrated truing attachments for a centerless and angular feed center type grinder. Figure 6 shows the centerless truing attachment in which a rugged slide guides the diamond bar for accurate cam following. The lever is used to lift the follower from the cam for shoulder work.

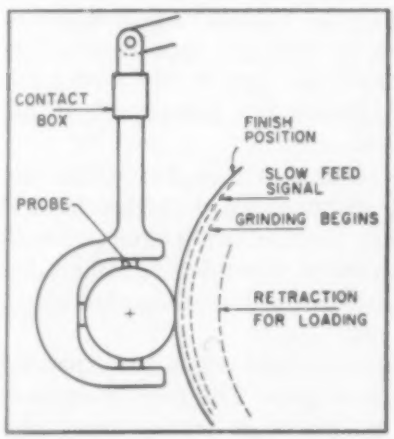
The overhead truing device shown in Fig. 7 is for cam operation to form the shapes on the multiple angular wheel operation. The box at the top of the device automatically downfeeds the diamond be-

fore truing begins. In this device, two diamonds are used for the two conical shapes for both face grinding and diameter grinding.

Gage Sizing

A recent development in grinding machines is that of automatic gage sizing. Here the machine is controlled directly from the workpiece. On center type grinders, this usually takes the form of a caliper gage (see Fig. 8) which operates electric contacts or air orifices. As previously stated, in order to obtain roundness, it is necessary to feed the wheel at a very low rate as size is approached. This is accomplished by having two signals, one when size is approached, which reduces the feed to a very low value and one to signal when size has been reached. When size has been reached the wheel is automatically retracted to the loading position. It is at once obvious that wheel wear is not important unless the wear is not uniform. On finish operations, the wheel wear is usually such that a very satisfactory length of interval exists between truings.

Further, refinements of an infeed machine of this kind require the series of events to move forward



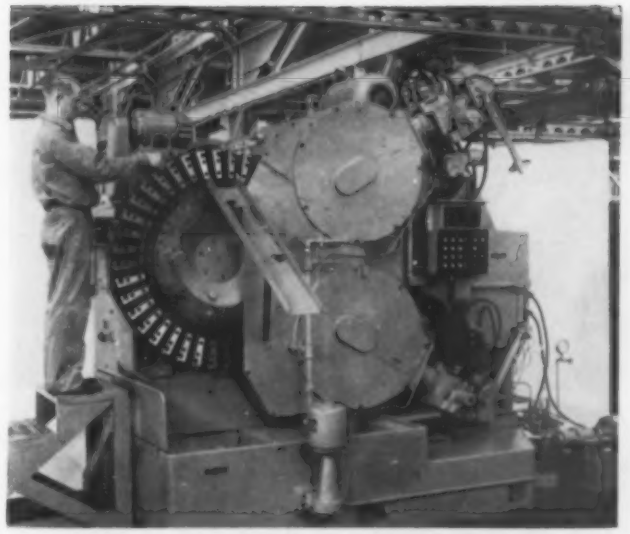
8—AUTOMATIC caliper gage sizing.

as the wheel wears or is trued. Slip devices are employed in the feeding system, so that as the wheel wears, the point at which rough feeding begins remains in the same relation to the work.

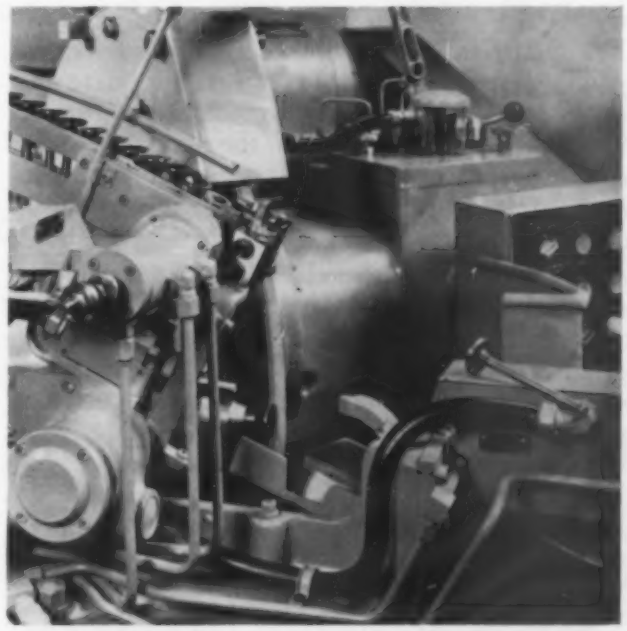
Special Grinding Machines

During the last few years, literally hundreds of special grinding machines have been developed for high production operations. A few of these machines are shown in the following illustrations. Some of these machines are on the basis of special applications of standard units. Usually, it is possible to employ some standard wheel head on these machines; however, due to the special nature of the workpieces to be ground, variations of the work-holding devices are many.

In Fig. 9, a drum fixture holds a multiplicity of rocker arms which, when they pass by the two wheels, are ground accurately to a form on their ends. One wheel roughs the pieces and the other finishes a small pad to a double radius. This is one

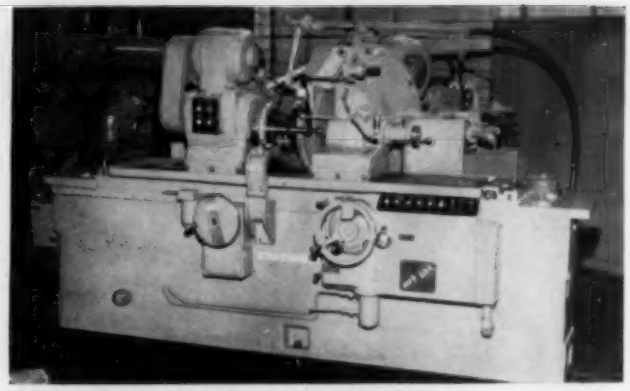


9—GRINDING ROCKER ARMS with special machine.



10—SPECIAL MACHINE for grinding seats on automatic valves.

11—SPECIAL 2-SPINDLE MACHINE, one in loading position with other in grinding position.



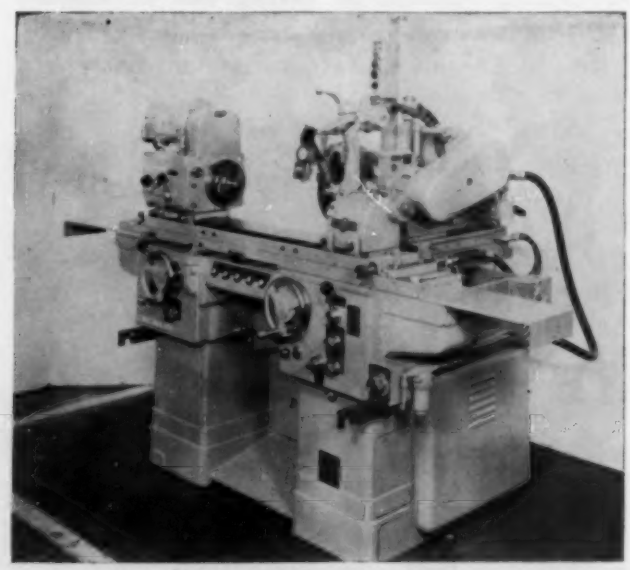
12—TYPICAL ANGULAR FEED GRINDER.

of the few cases where the workpiece is not rotated. The production on this machine was very large because for each rotation of the drum, 40 operations were completed. It will be noted that a special type of truing device is required, together with special wheelheads.

A special machine is shown in Fig. 10 for the grinding of seats on automotive valves. Here the valves are placed in the chuck automatically, ground, and ejected down the chute on the right. Again, the work head is special and must operate in time with the loading and grinding cycle. The wheel spindle oscillates and also is used as the infeeding chamber.

Figure 11 shows a special chucking machine of the turret type. Two spindles are built into a turret and while one is being loaded, the other is in the grinding position. In many infeed operations on small parts, the loading time may comprise a large percentage of the total cycle time even though the loading can be accomplished in a matter of seconds. It will be observed also that operator safety is an important by-product of this design. It will be noticed that the truing attachment is unique because the wheel must be formed to a double cone.

An angular feed grinder for two diameters and one face is shown in Fig. 12. This machine is operated by electro-hydraulic controls. The hydraulic infeed for the grinding wheel slides is controlled electrically from the caliper gage. For the operator's safety, numerous interlocks are incorporated; for instance, the infeed cannot be engaged unless the caliper gage is in place. On this machine, the truing device is at the rear of the grinding wheel and can be operated by electrical push-button control from the front or rear. A retractable flagging device on the front of the bed permits accurate end positioning of the workpiece prior to the grinding operation.



13—SMALL UNIVERSAL GRINDER equipped with automatic infeed and gaging for angular feed grinding.

Standard Grinding Machine

While many special grinders have been designed and installed in the high production fields, the standard grinders for toolroom and small lot production have also been greatly improved in recent years. In a similar manner to the special machine just described, the universal grinder has been improved in versatility where many are being used in small lot production.

In Fig. 13 is shown a small universal grinder which has been adapted to angular feed grinding with automatic infeed and gage grinding. This machine is made with numerous angular adjustments so that the set-ups can be changed rapidly and lots varying in length from one day to two weeks can be handled at a production rate comparable to the large special machines.

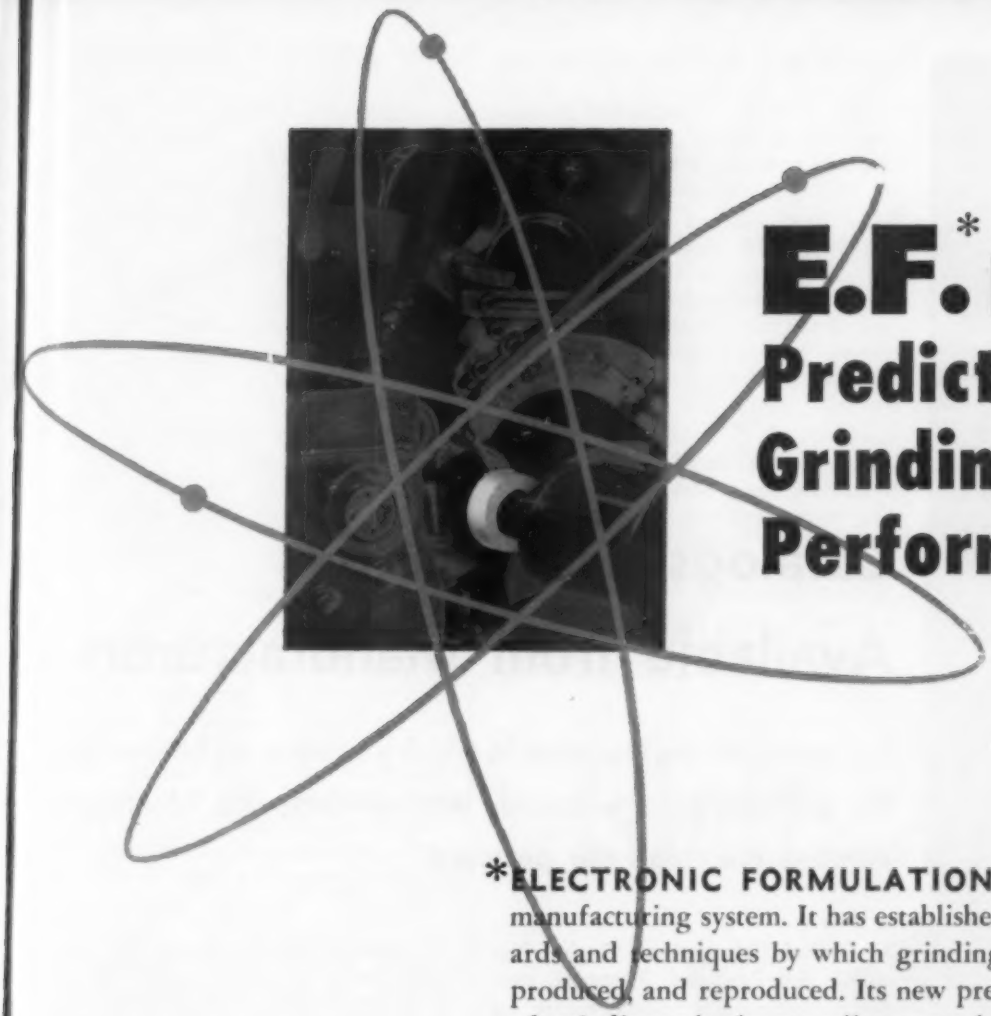
These machines, plain and universal which are used in toolrooms, maintenance departments, and small lot manufacture, are now being equipped with devices, such as electronic taper setting and other devices, to shorten the time required to grind gages, tools, boring bars, etc.

Roll grinding is another field which has expanded greatly in the past few years. The rapidly expanding steel industry has placed in service many new mills. The rolls used on these mills must be serviced at frequent intervals because of modern high-speed operations. Small diameter rolls for Sendzimir mills up to the backing up rolls weighing tons for the heavy hot mills, require grinders from medium size up to sizes which weigh up to 60 tons.

Another field for roll grinders which has expanded rapidly in recent years, is that of aluminum foil. The grinding of foil rolls has posed many problems because high finishes (1 to 2 microinches) and extremely accurate cambers are required. The foil is rolled to thicknesses of 0.0003 to 0.0004-inches. The lustre on the foil, in which so many everyday products are wrapped, is the product of the grinders which ground the rolls.

The uses of the precision grinding process are expanding every day, and it appears that the future holds still greater opportunities for abrasives.

Presented at the 24th meeting of the American Society of Tool Engineers, Chicago, Ill., March 19-23, 1956. • • •



E.F.* Lets You Predict Grinding Wheel Performance!

*ELECTRONIC FORMULATION is a new, fundamental manufacturing system. It has established the most accurate standards and techniques by which grinding wheels can be specified, produced, and reproduced. Its new precision applies to all types of grinding wheels as well as to other abrasive products.

Designed and Developed to take full advantage of modern electronic equipment, the "EF" system determines the precise amount of each ingredient. It does this rapidly and flawlessly. The results form a dependable basis for rigid manufacturing control, and are automatically retained on punched cards.

For Your Production Grinding, this means an entirely new degree of dependability, in three important ways. First, original "specs" can be more accurately pin-pointed for your work. Second, "EF" wheels can be more precisely manufactured to match these "specs". Third, replacement wheels can be much more nearly identical in cutting characteristics. "EF" lets you *predict* grinding wheel performance, the key factor in controlling your production grinding to match your production needs.

Ask your local BAY STATE DISTRIBUTOR about these important **"EF"** *advantages.*

BAY STATE ®
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U. S. A.
Branch Offices and Warehouses — Bristol, Conn.; Chicago, Cleveland, Detroit, Pittsburgh. Distributors — All principal cities.
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

Circle No. 220 on postpaid card

Available Literature

Catalogs and Bulletins Available from Manufacturers

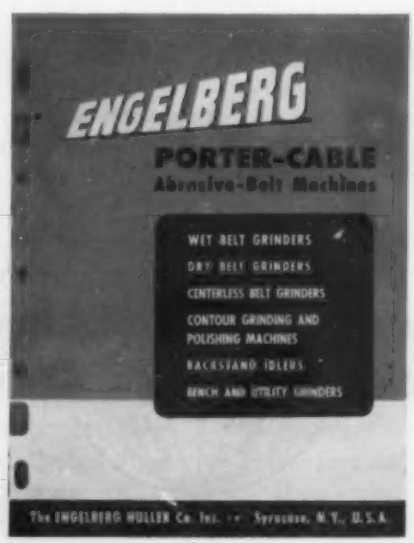
For copies of the literature in which you have an interest use the postage-paid postcard. Merely circle the identifying number and mail the postcard.

1. Optical Comparators. Catalog No. 402-C describes and illustrates new optical comparator developments by Jones & Lamson Machine Co., Dept. GF, Springfield, Vt. New advances in the line include a higher intensity lighting system; a new six-inch lens so that you can fill the thirty-inch screen at five magnifications; power elevation instead of hand operation on pedestal comparators; sharper and blacker lines which are virtually permanent. This supplements the sharper definition obtained with high intensity lighting.

(see Number 1.)

2. Abrasive Belt Machines. The complete line of wet belt grinders, dry belt grinders, centerless belt grinders, contour grinding and polishing machines, backstand idlers, and bench and utility grinders are described and illustrated in a new catalog available from The Engelberg Huller Co., Inc., Dept. RG, 831 W. Fayette St., Syracuse, N.Y. The complete line of Porter-Cable abrasive-belt machines are produced and sold exclusively by Engelberg Huller. Complete specifications and available accessories are included in the catalog.

(see Number 2.)



(see Number 3.)

3. Internal Grinder. Catalog available from Bryant Chucking Grinder Co., Dept. F, Springfield, Vt., describes and illustrates the Centalign automatic internal grinder, which is completely new in concept and design. The workhead, wheelhead and longitudinal and cross slide motions of the wheelslide have been brought into one common plane, reducing deflections to a minimum and insuring better alignment. It has a 10" swing and a 1" grinding stroke.

4. Abrasive Cutting. A new catalog on abrasive cutting and the wheels designed for the job are described in a new catalog available from The Allison Div. of American Chain & Cable Co., Dept. GG, Bridgeport, Conn. Included is a general recommendation chart for the selection of Allison abrasive wheels, both wet and dry cutting. Also included is a standard marking system chart.

5. Diamond Tools. A new diamond tool catalog available from Koebel Diamond Tool Co., Dept. FF, 9456 Grinnell, Detroit 13, Mich., is offered as a guide in making the most practical choice of a diamond tool. With each class of tool there is included a recommendation chart, based on the company's experience concerning the performance of diamond tools.

(see Number 4.)

6. Rotary Tools and Grinders. Metal Removal Co., Dept. FG, 1801 W. Columbia Ave., Chicago 26, Ill., has a complete literature package available covering their line of rotary tools and grinders, including grinding wheels, abrasive specialties, carbide and end mills.

7. Rust Preventives. F. E. Anderson Oil Co., Inc., Dept. RP, Portland, Conn., has published a comprehensive data chart of its rust preventives and coatings for industrial applications. Twelve different products for different uses are described in convenient chart form. This group of products forms a complete rust preventive service from work in process to final packaging and shipment.

(see Number 6.)

1 Unit... 3 Filtration Processes

• MAGNETIC SEPARATOR
• GRAVITY ATTRACTION
• FILTRATION

Delpark UP-FLO MAGNETIC SEPARATOR AND FILTER

...WITH PERMANENT FILTER SCREEN and 3 COMPLETELY AUTOMATIC CLEANING DEVICES

Combines the new Delpark powerful magnetic separator with a permanent filter media bar stock screen. Swarf bearing liquids flow on top of a large flat magnetic field. Magnetic unit incorporates more Alnico #5 magnets, gives twice the width of field, brings all swarf in suspension within the influence of the magnetic field, puts gravity to work in assisting the magnets and prevents washing and turbidity by using low velocity flow. This feature is particularly desirable on high viscosity fluids.

Three cleaning devices, completely automatic, remove the separated residue from the unit. Chain driven flights remove deposits from the magnetic field and the bar stock screen. .004" bar screen is cleaned by an air shaker device to dislodge enmeshed particles. A drag-out unit is built into the clean coolant tank.

Up-Flo Filters are available without magnetics for non-ferrous metal applications.

See your Delpark representative for more complete information or write.

Delpark FIRST IN FILTRATION ADVANCEMENTS

INDUSTRIAL FILTRATION COMPANY

Circle No. 221 on postpaid card

8. Diamond Wheel Data. A new diamond wheel data book and price list is available from American Coldset Corp., Dept. GR, 87-89 Court St., Paterson 3, N. J. Booklet included a standard wheel index, recommendation of the right wheel for the job, wheel application, bond for the job, grit size for the job, wheel specifications, and the complete line of diamond wheels. A discount schedule is also included.

9. Grinding Machines. Catalog available from Boyar-Schultz Corp., Dept. GG, 2000 S. 25th Ave., Broadview, Ill., describes and illustrates model 6-12 and model 6-18 surface grinders. Also described is the No. 2 dual and single spindle surface profile grinder and the No. 1 bench model profile grinder. Complete specifications are given for the machines, along with standard equipment furnished and optional accessories available.

10. Hand Pumps. Bulletin 3011 available from Bowser, Inc., Dept. RG, Fort Wayne, Ind., describes and illustrates their complete line of double action piston type hand pumps. These pumps are made entirely of corrosion resistant materials for long, trouble-free performance. Body and piston are die-cast aluminum. Pumps are limited only by the temperature characteristics of the liquids handled. Unauthorized operation of the pump may be controlled with the handle locking device.

11. Tap Chamfer Grinder. Bulletin 554 describes and illustrates the No. 2 tap chamfer grinder manufactured by the Edward Blake Co., Dept. G, 437 Cherry St., West Newton 65, Mass. This machine salvages expensive taps, can be operated productively by semi-skilled labor, and does not tie up any other machine. An attachment for chamfer grinding bent and hook shank taps is available. It will sharpen RH and LH taps with 2, 3, 4, 5, 6, 8, and 10 flutes.

12. Flat Lapping Service. Lapmaster Div. of Crane Packing Co., Dept. F, 6400 Oakton St., Morton Grove, Ill., has literature available describing and illustrating the facilities available for their flat lapping service. New and enlarged production facilities provide you with fine service at economical cost. Special laboratory equipment is maintained to determine the exact needs of your lapping requirements.

13. Barrel Finishing Compounds. A new folder has been released by the Esbec Barrel Finishing Corp., Dept. G, 18 Beech St., Byram, Conn., covering specifications and application information on fourteen different Esbec color-coded compounds and abrasives. Of particular interest is a unique compound-use chart, which is a quick, handy reference for determining recommended compound types for various materials and different finishing operations.

14. Die and Mold Grinders. Wherever surplus material is to be removed, or finishing operations performed, and where a portable tool capable of delivering constant power is indicated a Haskins flexible shaft machine is designed to do the job speedily and efficiently. The bulletin available from R. G. Haskins Co., Dept. FG, 2651 W. Harrison St., Chicago 12, Ill., describes and illustrates the various models in the line along with spindles and other attachments.

15. Carbide Tool Grinder. The model OC-6, oscillating carbide tool grinder is described and illustrated in literature available from Hammond Machinery Builders, Inc., Dept. RG, 1600 Douglas Ave., Kalamazoo, Mich. The outstanding feature of this machine is an oscillating spindle. The operator now only has to grind; he no longer has to oscillate the tool.

16. Reamers. K. O. Lee Co., Dept. GF, Aberdeen, So. Dakota, has literature available describing and illustrating their line of precision pilot reamers, Knock-Out wheel dressers, Lee hone and reamer drive, Slip-Proof stud wrenches, Lee A.C. arc welders and accessories, keyless drill chucks, and expanding mandrels for milling, turning and grinding.

17. Centerless Thread Grinder. Bulletin E-97-1, available from Landis Machine Co., Dept. G, Waynesboro, Pa., describes and illustrates the No. 1 centerless thread grinder. Bulletin contains detailed data concerning construction, grinding methods, applications

NO. 2 *"Roughing it"* with Reddy MacFlint

"Talk about a 'plushy joint'
— you should see the velvet joint
on JEWEL BRAND *Abrasive Belts!*
It's smooth! Won't bump or jump . . .
an AP development that
helps manufacturers speed up
finishing, improve quality."

"Smoothing the way where the going is rough"

In addition to better and more efficient uses for abrasives, AP salesmen frequently offer new developments. Check him — if you're interested in improving an abrasive process.

Abrasive Products, Inc.
South Braintree 85, Mass.

Circle No. 222 on postpaid card

For Precision Surfaces Specify CORTLAND

ROLL GRINDING WHEELS

Plus Value

The generation-to-generation skills which go into every Cortland wheel are a day-in, day-out stock in trade that represents a plus value few manufacturers can offer.

Team this inherent talent for fine craftsmanship with advanced methods, sound engineering, modern equipment and rigid quality control, and you have the reason why, for many years, Cortland Grinding Wheels have been favorites with leaders in industry.

When you specify Cortland Roll Grinding Wheels, you can depend on consistent uniformity, economical cutting rate and long life.

For example, a test of Cortland's C36-M-7BE Carbora Resinoid on hot strip mill rolls of chilled iron alloy was reported "exceptionally satisfactory, fast cutting and more rolls ground than with any of the competitive wheels." A check test established the Cortland wheel as standard for this operation.

CORTLAND GRINDING WHEELS CORPORATION

Chester, Massachusetts

If you have a grinding problem, there's a Cortland *job-engineered* wheel that will solve it. Let's get together and talk it over.

CORTLAND

Circle No. 223 on postpaid card

and specifications. Primarily designed for high production precision threading by the thrufeed method, it may also be utilized in the infeed grinding of headed or shouldered workpieces.

18. Gear Deburring Machines. Bulletin BM-1, available from Modern Industrial Engineering Co., Dept. RG, 14230 Birwood Ave., Detroit 38, Mich., describes and illustrates their line of Burr-Master gear deburring and chamfering machines for internal and external gears and splines. Specifications and capacities are given for each machine.

19. Surface Grinder Tools. Montgomery Tools, Dept. GF, 7 Tichenor Lane, Newark 5, N.J. has literature available describing and illustrating eight different tools for use on surface grinders. Included are a new tool holder for power grinding, the Eclipse magnetic holder, Squar-It clamping blocks, Sky-Hook attachment for grinding long jobs at the top of the wheel, a new diamond holder, Sine angle wheel dresser, and portable demagnetizers.

20. Barrel Finishing Machine. Mido Products, Dept. F, 1801 Border Ave., Torrance, Calif., has literature available describing and illustrating their Mastercraft variable speed or single speed barrel finishing machine. Unit is furnished with timer, 3/16" natural gum rubber vulcanized lining, separator screen, receiving pan and perforated wash-out door. Complete specifications are given.

21. Disc Sanders and Grinders. Folder available from Max Mfg. Co., Dept. RG, 138 Stockton Ave., San Jose 26, Calif., describes the line of disc sanders and grinders. Sizes range from 16" to 36", with single and double disc models in each size. Also shown in the folder is the new Max abrasive cut-off machine; the Max abrasive belt grinder, and the line of Acme saw sharpeners.

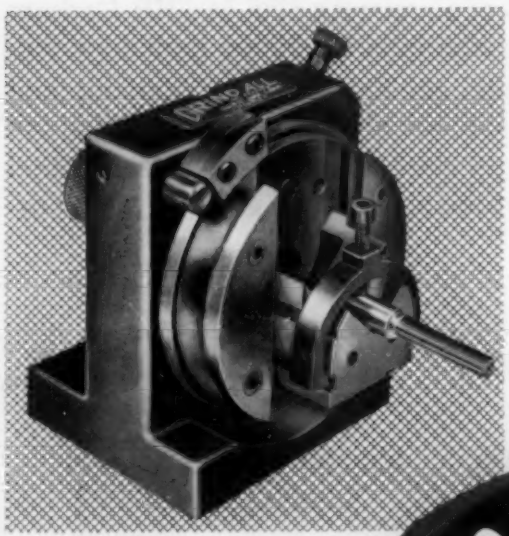
22. Flat Lapping Service. A new, illustrated brochure issued by the Lapping Div. of J. B. Maris Co., Dept. F, 14 Henry St., Bloomfield, N.J., announces and details various advantages and features of its production flat lapping service where flatness, surface finish or parallelism, or combined characteristics, are desired in finishing of all metals, plastics, ceramics, glass and other materials.

23. Revolving Cup Guards. Morrison Products, Inc., Dept. GG, 16816 Waterloo Rd., Cleveland 10, O., have a folder available describing their line of revolving cup guards, either flaring or straight, designed to give maximum protection without interference. These guards are approved on threaded hole insert wheels which are so designed that the wheel is securely held in place after breakage. These guards for portable grinders are said to give maximum protection with lighter weight.

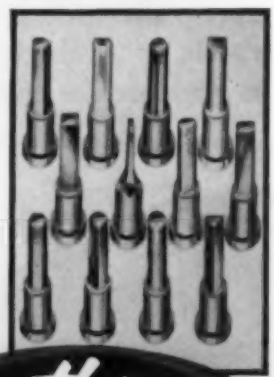
24. Centerless Grinding. Bulletin No. 14-10M-8-53, describes and illustrates the type 914 centerless grinding and finishing machine, a new centerless grinding machine using abrasive belts. Available from Production Machine Co., Dept. GF, Greenfield, Mass., this machine is said to be accurate, fast, and is heavy duty and has a reversible traverse action. It is capable of stock removal on bars and tubes 1" to 6" in diameter, and with proper fixtures, of any length and weight.

25. Profilometer Equipment. A new catalog of Profilometer equipment for shop measurement of surface roughness has been announced by Micrometrical Mfg. Co., Dept. G, 345 S. Main St., Ann Arbor, Mich. Catalog is arranged in sections covering equipment for manual operation; portable equipment for straight-line mechanical tracing on hard-to-reach surfaces; and equipment for circular tracing.

26. Sandblast Machines. A new bulletin illustrating and describing the complete line of Leiman sandblast machines for cleaning, deburring, surface preparation, stenciling and matte finishing on metal, glass, plastics and compositions, is available from Leiman Bros., Inc., Dept. FG, 102 Christie St., Newark 5, N.Y. Complete details of dimensions, construction, work range and operations are given.



Perforator Grinding
±.0002 with greatest speed accuracy and range



the Grind-All FIXTURE

made by the house that precision built

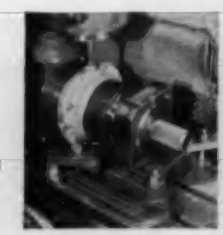
Headquarters for the Finest ... Precision Tools

Here is higher accuracy, greater range and maximum speed in grinding perforators. Meets the requirement for a more versatile perforator grinding attachment. Grinds many irregular shapes concentric with shank.

Also performs other functions such as light milling and boring fixture, inspection tool, etc.

Consult our engineering staff when you need precision tools or dies. Send for free catalog.

Harig Manufacturing Co.



INSPECTION TOOL

Circle No. 224 on postpaid card

By **Edmund Mottershead,** President
Mottershead Associates
Chicago, Ill.

GRINDING safely

Swing frame grinders such as that shown on this page are for use on castings too large to be brought to the wheel, and are carried to the workplace by crane or hoist. Suspended from their center of gravity, using relatively hard wheels, these tools have still been subject to modification by the ambitious and ingenious workman.

Even though wheels have been installed in the machines on the premise that an operator can exert a fairly uniform pressure during the working day, here and there a superman or a mechanically inclined individual will exceed the normal pressure either with sheer muscle or by using auxiliary leverage devices of his own contriving. The result is that his production—and paycheck—jumps to new heights, while his wheels melt away like butter in the sun. Management has regularized some of these conditions by supplying leverage devices for all while supplying still harder wheels to withstand the pressures.

At the same time, there are various dodges which workmen have been known to use when they thought they could get away with them, designed to increase their production without regard for machine or wheel condition or the safety factors involved. Such stunts as grooving the wheel face, breaking wheel corners, bumping the work with the wheel, and increasing the unit pressure in various ways can be seen and checked by the foreman.

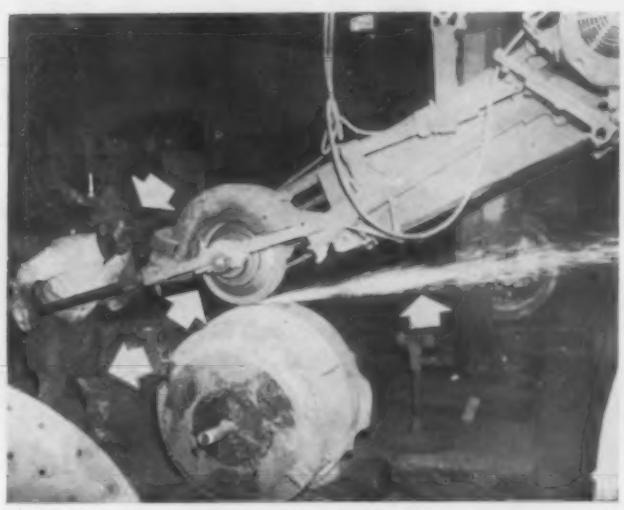
The organic bonded wheels used on this type of equipment are relatively strong when compared with wheels used on precision machines or for tool grinding, yet there is still a limit to the strength which can be built into them. The strength of any wheel is tied up to a great extent with its grinding action, and although conceivably a wheel could be made strong enough to resist virtually any type of abuse, such a wheel would not have much value as a material-removing tool. Therefore it is well to remember that under conditions of abusive and improper operations, the wheels used in heavy duty snagging such as with the swing-frame grinders can be broken and can create hazards brought about by such improper operation.

SAFE SWING GRINDER OPERATION

. . . WRONG

OPERATOR DEMONSTRATES INCORRECT AND UNSAFE swing grinding operation. Note absence of goggles, drive end of grinder hung too low, grinding wheel too low and below top surface of work. Result of improperly hung machine is to throw operator's arms too high in awkward position making it difficult and tiring to operate the grinder. Low position of wheel makes it subject to bumping, erratic operation, possible wheel breakage.

. . . RIGHT



CORRECT OPERATION INCLUDES USE OF GOGGLES, protective clothing, safety shoes, and good chocking and blocking-up of the casting being snagged. Grinder is raised higher so that, with motor end high in the air, operator has comfortable angle from which to hold handle bars and lean his weight into the operation while keeping the wheel up on the casting where it belongs. Less operator fatigue means more production and greater safety.

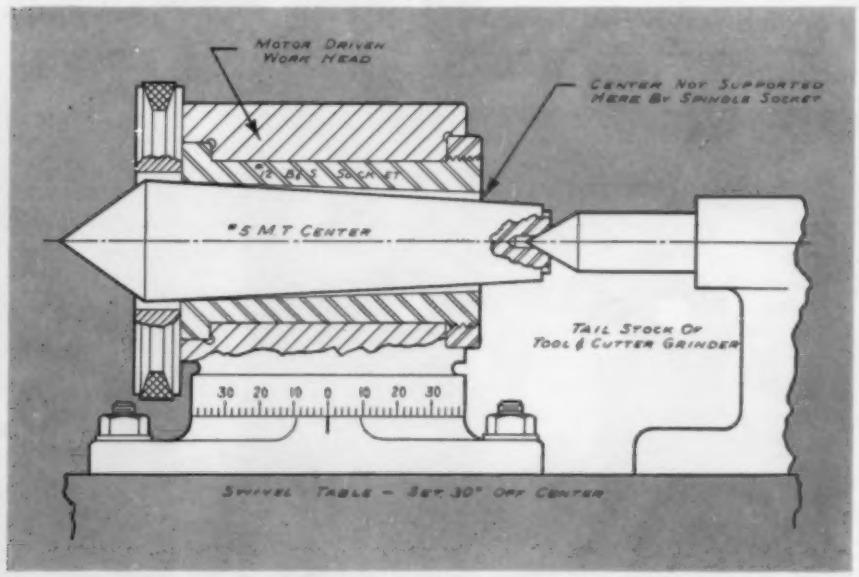
Shop Hints and Short Cuts

Emergency Center Grinding Method

By **H. J. Gerber**

A number of times we have been faced with the necessity for regrinding badly burned off lathe center points. This is a slow job with a tool post grinder and ties up the large lathes while the job is being done. We usually grind our smaller centers by sleeving them out in our tool and cutter grinder. This is a fast and economical method but would not work on these large centers as the B. & S. socket of the spindle on this cutter grinder was too small to sleeve out for these large Morse taper centers. We tried out the illustrated holding method and found it to be very successful.

The center is forced into the socket of the work head spindle and of course will contact only at the large end of the taper due to the fact that the Morse taper has a larger TPF than the B. & S. taper spindle. To align the center dead true on the spindle we bolt the left hand plain grinding center of the machine to the table immediately behind the work head. This tail center is then forced up into the center hole in the end of the lathe center to align it true. The lathe center is tapped lightly on its nose to seat it firmly into the socket and onto the tail center and friction contact will be sufficient to drive the center for even coarse grinding. A test indicator is placed both against the nose and the tail of the lathe center to verify its alignment and this usually proves to be within .0005" FIR. Naturally the work head itself is not set over at 30 degrees off center as is usual for this type of work but instead the swivel


Motor Driven Work Head
Center Not Supported Here By Spindle Socket
#5 B & S Spindle
#5 S.M.T. Center
Tail Stock Of Tool & Cutter Grinder
30 20 10 0 10 20 30
Swivel Table - Set 30° Off Center

Do you use short cuts in your work? Do you have any kinks which would be helpful to the next fellow? Send them to GRINDING and FINISHING for publication. All material is paid for! Material can be in your own words, drawings can be rough pencil sketches; our editorial and art departments will do the rest. Send your Hints and Kinks to: Editor, GRINDING and FINISHING, 222 E. Willow Ave., Wheaton, Ill.

table is set over to produce the 60 degree point on the center.

This quick set up has proven to be so successful that it has become standard procedure for the reconditioning of large lathe centers in our shop. • •

Superfinished Mill Rolls Deliver Longer Service

The never ending problems of mill roll maintenance led to a series of tests that were conducted by a well-known rolling mill, that produces stainlesss steel strip stock. They wanted to extend the working life of the individual mill rolls and they also wanted to reduce the time and expense of refinishing the rolls. Special arrangements for these tests were made with Gisholt Machine Co.

Test rolls were shipped to Madison, Wis., to be superfinished. These were then returned to the mill and put in production where it was found that one set of superfinished rolls ran 36 machine hours, as against less than eight hours for a similar set of ground rolls. In another test it was found that superfinished rolls would handle 280, 000 lbs. before refinishing, as against less than 100,000 lbs. with ground rolls. In a salt spray test it showed there were less iron inclusions in the stainless steel rolled strip when the mill roll had been superfinished.

Based on these tests a Model 78 mill roll superfinisher was ordered and is now in use in this plant. The machine has a completely automatic cycle and is adjustable to handle a wide variety of rolls up to 20″ diameter and 36″ roll working surface. Rolls with a single or double crown measuring from .001″ to .007″ are also handled on this machine.

The cycle starts with the operator loading the roll into the machine. The roll is driven with a special adapter, is supported with a tailstock, and rests on its own bearings. As the roll is driven, the superfinishing stones contact the work and are oscillated and traversed back and forth over the length of the roll. Three automatic changes of spindle speed give roughing, semi-finishing and finishing operations. At the completion of the cycle the spindle brake is applied, the roll is wrapped to protect the superfinished surface and is then removed from the machine.

Additional tests are now being carried on at the mill. The complete superfinishing operation is taking a maximum of 15 minutes, depending on the size of the roll. Tests on stones are giving a resultant surface roughness of 1 micro-inch rms. or less. Life of the superfinished roll has generally been found to be three times the life of ground rolls. • •

Ever see a ROUND WHEEL fit into a SQUARE CORNER ?

GRIND-O-FLEX DOES IT

Unretouched photo

Here's a 3-inch diameter Grind-O-Flex wheel smoothing and blending draw marks and welds on a tubular frame. Note how it shapes itself to the contour.

and for ROUGH JOBS...

Grind-O-Flex comes in big diameters too—in fine or coarse grits—to blend welds, smooth casting flash, polish rough surfaces. Wheels form themselves to fit the job. No danger of "digging" into stock. There is a grit grade to fit your job, polish or grind.

Beautiful-finish-wise, cost-wise and time-saving-wise, nothing can touch GRIND-O-FLEX.

Our Engineering Staff can recommend the wheel for your job, and a supply source near you. Write us.

merit PRODUCTS, INC.

4023 Irving Place, Culver City, California

Circle No. 225 on postpaid card

Automotive Valve Tappets Ground Automatically

Grinding automotive valve tappets to close tolerances and still maintaining high production rates was a problem to the automotive industry up until a short while ago. Motch & Merryweather Machinery Co. of Cleveland designed and built an automatic grinder designed especially for the purpose of grinding a spherical radius on the heads of valve tappets.

The radius is produced exactly according to the radius of the table with the .015" of metal removal provided by four grinding spindles mounted at right angles to the fixture.

Tappets are placed into the hopper and from this hopper introduced into a double track loading mechanism cammed to load two tappets into the fixture at a time. The table containing the 160 individual fixtures rotates continually at approximately 140 inches per minute in a clockwise direction.

The tappets are clamped firmly in the V-type holding fixtures. The continuous clockwise rotation of the table passes the tappets across the face of the rotating grinding wheels with each of the four horizontal Blanchard heads removing a portion of the stock. The fourth head is equipped with a special grinding wheel to provide a good finish. Each grinding head is equipped with automatic head infeed to compensate for wheel wear. Each grinding head slide is provided with a hand adjusting screw to permit retracting the heads for grinding wheel replacement. After having been finish ground, the tappets are automatically ejected into a take-off chute, and the open fixtures are flushed by coolant before reaching the automatic loading station. A central coolant system furnished by the customer provides coolant at each operating station.

Production is approximately 4000 pieces per hour at 100 per cent efficiency. The surface finish obtained averages approximately 10 micro inches.

• •

Filtration of Coolants in Stainless Steel Finishing

The highly polished, easily cleaned surfaces required in stainless steel work are the result of grinding and polishing operations that call for the constant use of coolants.

At the plant of a Pennsylvania manufacturer, sheets of stainless steel are given a surface treatment with a special grinder called the absoplane machine, to remove the dull color of the new metal and eliminate any tiny pittings that may be found in it. On the absoplane machine endless fabric abrasive belts are used which must be constantly flooded with coolants to prevent temperatures that would quickly destroy the fabric and ruin the belts.

For their particular operation they used a No. 20 Hercules pressure leaf filter. One hundred gallons of coolant pass through the filter per minute to remove all metal and recirculated through the absoplane machine. As required, the coolant is kept entirely pure at the point of contact with the work.

• •

Brand New!

haskins

hask AIR Grinder...

most powerful air turbine grinder in its class!

75,000 R.P.M.

(1/5 H.P. prony brake test)

- **Permanently sealed bearings . . . never needs lubrication in air lines or grinder.**
- **Removable nose piece for deep grinding.**
- **Gyro action of turbine holds tool steady.**

Here's power—SUSTAINED POWER—like you've never experienced before in an air grinder . . . power unexceeded by any other air grinder in the same price range . . . maintains its high-speed efficiency under load! Built with a lightweight, contoured, hand-fitting aluminum housing, the Haskins **hask AIR** Grinder handles easily, balances perfectly . . . excellent for the most precise grinding job. Complete kit includes: carrying case, adapter hose, mounted points, dressing stone and wrenches.

for Complete details WRITE

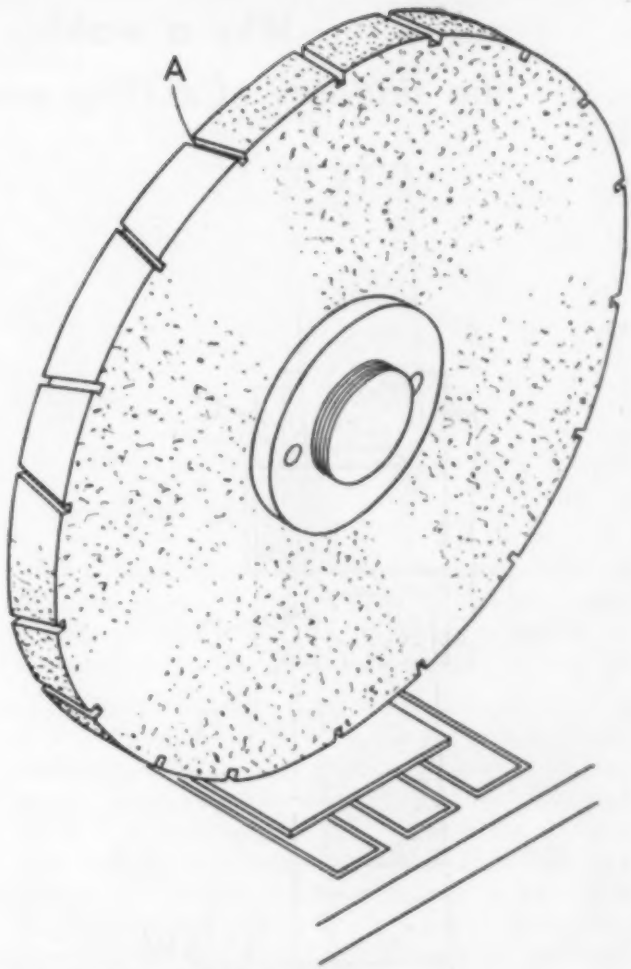
haskins

HASK-AIR HASK-FLEX

2649 W. Harrison St.
Chicago 12, Illinois

Circle No. 226 on postpaid card

One reason why the grinding of the sides of plate gages is avoided by tool makers is the tendency for thin hardened steel plates to curl. After the first side has been ground, it will often be found that grinding of the second side causes the plate material to curl. This warping of thin steel plates during surface grinding can be minimized by adopting one or more of the methods here described.



1. Showing use of a slotted wheel.

By **C. T. Bower**, A.M.I., Prod. E.

GRINDING AND FINISHING'S London Correspondent

How To Grind Thin Steel Plates

THREE METHODS ARE AVAILABLE

1. *Use a slotted wheel*
2. *Utilize a wobbly wheel*
3. *Try spot grinding*

• Although the sides of the plate from which a gap gage or form gage is made need not be machined, a more reliable gage will be produced if the both sides of the plate are ground flat and parallel to one another after the form of the gage has been roughed-out. With flat and parallel sides the checking of the gage profile or the width of the gaging faces is accomplished with greater precision because the ground sides form an accurate datum.

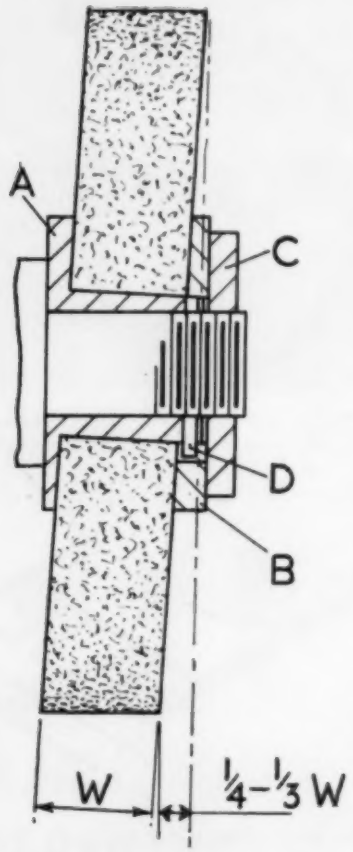
In the case of a simple gap gage, for example, which is made from ⅛-in. thick steel plate, lack of parallelism of the narrow gaging surfaces will result in line contact instead of surface contact and will cause gage to lose its size rapidly. If both sides of the gage plate are ground flat and parallel before the actual gaging faces are finish-ground to size, the danger of loss of parallelism is reduced considerably.

Using a Slotted Wheel

One expedient which can be adopted profitably is the slotted wheel. The normal grinding wheel on the surface grinder has a series of slots A cut in its periphery, as illustrated in figure 1. The slots are spaced about 1-in. apart on the wheel circumference and are between ⅛- and ¼-in. deep. The spacing of the slots can be by "eye" and it is better if they are placed at an angle to the wheel axis rather than parallel to it. Slotting of the wheel can be done by using an old machine saw blade.

Placing the slots askew reduces the tendency for the wheel to bounce. The wheel works well with or without coolant; but coolant should be used if

Why a wobbly grinding wheel? It reduces the dangers of curling and heating the work surface



2. Details in use of a wobbling wheel.

possible. Any tendency for the work to curl when using the slotted wheel can usually be minimized by reducing the depth of cut and the rate of table traverse.

Wobbling Grinding Wheel

Another expedient used successfully for more than 25 years in one gage making shop to reduce the dangers of curling and to give free cutting is the adoption of the wobbling grinding wheel. The grinding wheel axis is tilted in relation to the grinding spindle axis, as shown in figure 2, so that the wheel wobbles sideways as it is revolving.

The amount of sideways tilt of the wheel face is between 1/4 and 1/3 of the wheel thickness. A thick wheel has been shown purposely in figure 2 so that the tilt will be clearly shown; in actual use, wheels of ½-in. thickness are more commonly employed for this method.

To mount the wheel in the tilted position, a shouldered adaptor is made, as shown at A and to accommodate it, the bore of the wheel should be larger than the grinding machine spindle diameter. A tapered washer B must also be made so that the wheel clamping nut C of the machine has a square face to tighten against. Washer and adaptor are located in correct radial relation to one another by means of a pin D in the adaptor and engaging with a slot filed in the bore of the washer.

After the tilted wheel has been mounted, it must be trued up on the periphery by means of a dressing diamond until the high corners caused by the tilt have been removed. The wheel is dressed in the normal manner, as if it were mounted perfect squarely on the spindle.

Advantages of the wobbling wheel include the reduced risk of heating the work surface and the generation of hair-line cracks. There is a marked freedom from curling of thin plates and less power is required to hold thin work of, say 1/32-in. thickness, on to the magnetic chuck against the wheel thrust. The cutting action is intermittent, as the leading edge of the slanted wheel comes around once per spindle revolution.

Wobbling wheels would appear, at first sight, to be dangerous, but experience has shown them to be perfectly safe during 25 years in which they have been employed in one tool shop; not one wheel burst has occurred. The wheel is in perfect static balance and the slight dynamic out-of-balance is insufficient to cause vibration in grinding spindles which are capable of carrying a 7-in. wheel in the normal way. The internal stresses caused in the wheel by the wobble mounting are greatly overshadowed by those to which a normal wheel is subjected by centrifugal force.

Speeds and feeds with a wobbling wheel are no different than those for a standard wheel mounting and in many cases, heavier cuts can be taken. When grinding cast iron, a wobbling wheel of approximately No. 46 grit has proved to be really advantageous.

Spot Grinding

For really precise production of flat and parallel plate shapes, the process known as "spot grinding" is worthy of wider adoption. Flatness and parallelism to a tolerance of 0.0001-in. and less, are obtainable when the process is used under proper conditions.

With spot-grinding, errors which are present in the longitudinal and cross slides of the machine table and which affect strongly the accuracy of work produced are eliminated entirely, since the table traverse is not used. The work is ground by sliding it about in all directions under the grinding wheel while it is supported by a good surface plate fixed

to the stationary table. The resulting finish is spotted and looks rather like hand scraping.

After the work has been spot-ground on one surface, it is turned over for treatment of the other side. With a good wheel spindle, automatic generation of parallelism of one face with another is assured and the errors of flatness will not exceed those of the surface plate; they are usually less. If complete "sparking-out" of the grinding cut is allowed, accuracy of less than 0.0001-in. is possible.

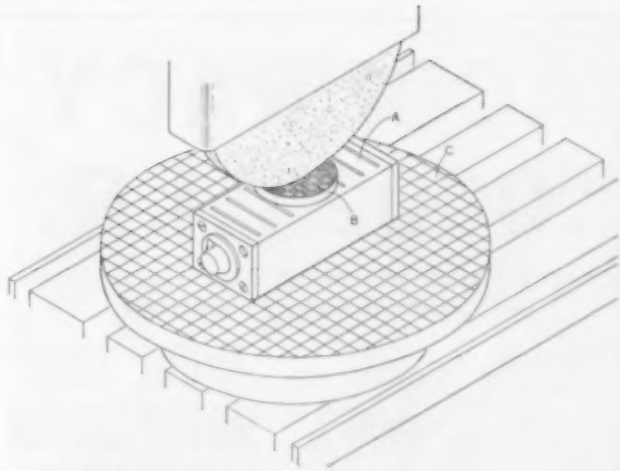
Spot-grinding is applicable only to the final finishing operation and the allowance per face should not exceed 0.002-in. This allowance can be reduced when some experience of the process has been gained. The surfaces should be prepared for spot grinding by surface grinding them in the normal way by using the machine table traverse. For spot-grinding, the bottom surface in contact with the surface plate must not be convex, or rocking of the work will result.

Depth of cut for spot-grinding is, naturally, small. A cut of 0.0005-in. deep should be the maximum and this should be reduced progressively as grinding proceeds until the final cut is removing no more than 0.0001-in. from the surface. The initial cut is taken over the surface by pushing the work against the direction of the wheel rotation, the surface is then finally spot-ground by cuts not exceeding 0.0003-in. deep. Wheel grades that have been found suitable for ordinary dry grinding are satisfactory for spot grinding work.

The size and weight of the work must be taken into account when spot-grinding. The size must be sufficient to allow the work to be moved around, safely, by the fingers. The weight should not be less than about 3 lb.; anything lighter will tend to be lifted from the surface plate by the wheel suction. If the work is too small and light in weight, the best holder is a small magnetic holder of the type shown at **A** in Fig. 3. This form of magnetic holder allows one face, on which the work **B** is placed, to be magnetised by turning the knob at the end. The other side of the magnetic holder in contact with the surface plate is unmagnetised and can be slid about freely. The magnetic holder increases the weight to a safe amount and offers a useful volume for gripping with the hands. The holder should itself have been spot-ground on the surface plate so that it is perfectly flat and its upper and lower surfaces are parallel.

For successful spot grinding, the wheel head slide of the machine must be reliable, in that it must have no tendency to drop and gouge the work. It must move freely in response to fine vertical adjustments by the handwheel. There must be no "stick-slip" effect in the slides.

Wear will, inevitably, take place on the surface plate because of the grit deposited thereon from the grinding process and the wear will be greatest at the



3. Method of spot grinding.

surface plate center. This is not so serious in practice as would appear. When the plate flatness has deteriorated, it can be restored by spot-grinding while mounted on another good surface plate.

The circular surface plate shown at **C** in figure 3 is of cast iron and about 12-in. diameter; it has been made especially for spot grinding. Grooves are cut in two directions in the top surface of the plate and are of V-shape, about 1/16-in. wide at the surface. They should be pitched at 1/4- or 5/16-in. intervals and provide pockets for the reception of grit from the grinding and thus reduce the rate of wear. The grooves assist free sliding of the work on the plate and prevent any tendency for dry flat surfaces to "wring" themselves on to the plate.

Plates are used in a dry condition; a little kerosene is sometimes used as lubricant to help free sliding of heavy work on the plate surface, but this, in combination with the grinding grit tends to produce an abrasive compound which wears the plates rapidly. In most cases, if the plate is cleaned periodically with gasoline it will present a freely sliding surface for the work.

The surface plate need not be levelled when setting up, but the wheel edge should be dressed with the diamond holder mounted on it. The diamond point should be immediately below the spindle axis and the transverse table feed used for transversing the diamond point across the wheel edge. The transverse slide will not necessarily make the wheel edge parallel to the surface plate.

Despite its somewhat coarse appearance, a spot-ground surface is extremely accurate and can be used without any final lapping in most cases. If a wringing surface is required, lapping of about half-one-tenth of a thousandth from the surface will produce a high finish. The scratches left by spot grinding are very shallow and can be maintained in this condition if the final cut has been thoroughly "sparked out" on a wheel of about No. 60 grit.

• • •

ACCURACY .0002 T.I.R.

.0002 T.I.R. OR LESS AT SPINDLE NOSE, .0005 T.I.R. OR LESS ON TEST ARBOR SIX INCHES FROM SPINDLE NOSE

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost. Same Accuracy Guaranteed!

The B943 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table. The swivel base, which is graduated 90° one side of center and 45° on the other, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired. The B943 is easily and quickly mounted on other makes of grinders.

The No. 11 B&S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. Unit is grease packed at factory and requires no service in the field for the life of the bearings. Streamlined in design, this fixture is quickly mounted and is easy for the operator to keep clean.

The special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor operates quietly and is fully protected from dust and from any oil entering from working parts.

See this extremely accurate B943 work head at your equipment dealer or write for complete literature.

K. O. LEE COMPANY

ABERDEEN, SOUTH DAKOTA

Circle No. 228 on postpaid card

Bryant Centalign automatic internal grinder with guards removed.

Automatic Internal Grinder

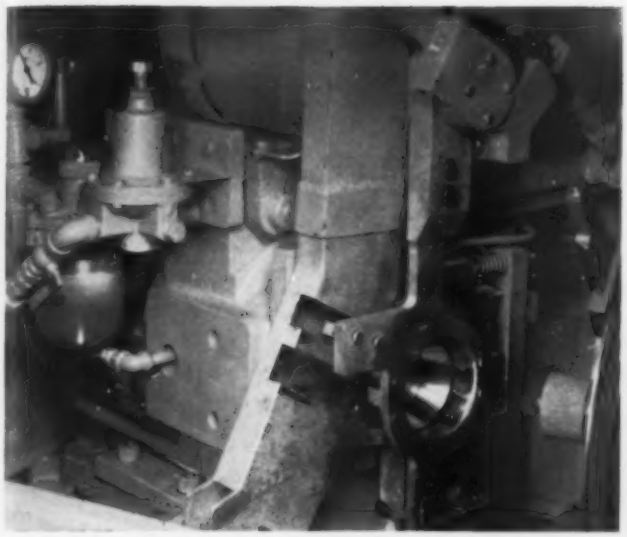
for long-run, high-production grinding of bearing raceways and taper bores

The Centalign automatic internal grinder, manufactured by Bryant Chucking Grinder Co., of Springfield, Vt., employs new principles of construction for greater rigidity and stability and is capable of faster stock removal and greater accuracy. The workhead, wheelhead and longitudinal and cross slide motions of the wheelslide have been brought into one common plane, reducing deflections to a minimum and insuring better alignment. Vibration absorbers incorporated in the fabricated bed dampen all forces and assure fine finishes and consistent accuracy of work parts produced.

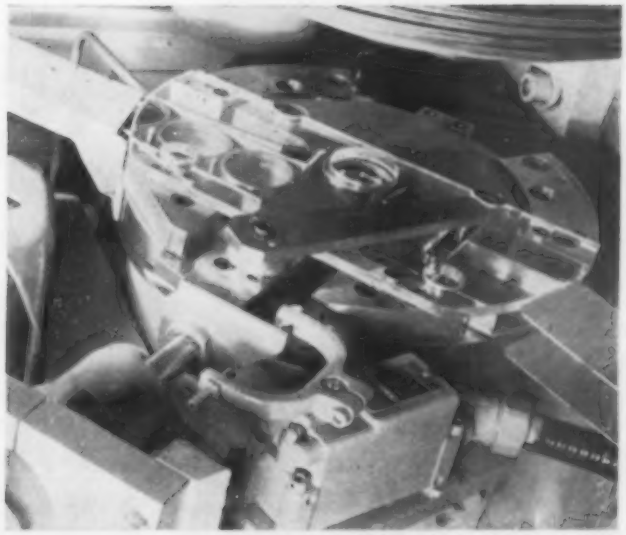
The Centalign, with its 10" swing and 1" grinding stroke, is designed for the long-run, high-production grinding of bearing raceways and taper bores, and for similar operations on various work parts. However, the control of machine function by programming cam sets, which can be readily interchanged as a unit, makes certain types of recurring short run operations feasible.

The stroking motion of the wheelslide is provided by a large sleeve moving in balls pre-loaded between the sleeve and a cylinder. It is actuated by a simplified servo-controlled hydraulic system, which in turn is programmed by a simple interchangeable cam unit. Thus, the power transmitting forces are completely segregated from the cycle control mechanism, combining the most important advantages of both cam and hydraulically operated machines. Grinding stroke length can be adjusted from 1/16" to 12, either during machine operation or while the machine is at rest.

All cross-feed forces are applied directly on the center plane of the wheelslide close to the wheelhead. This is ac-



Automatic loading shoe type centerless fixture used to hole taper roller bearing cups.



Automatic loading shoe type centerless fixture used in grinding bearing raceways.

complished by incorporating the cross-feed screw and the compensating feed screw in the front trunnion support of the wheelslide. Three-fourths of an inch of cross-feed motion is provided.

The camshaft and cams which program the Centalign are conveniently located above the rear end of the wheelslide. When job change-over is required, the entire unit of cams and camshafts can be easily removed and stored for future use.

The machine is equipped with new series 800 Bryant high frequency wheelheads, powered by high frequency motors to provide abundant power for the toughest grinding jobs.

The machine is especially adapted to the use of two standard types of shoe centerless fixtures. The larger fixture will hold work up to a maximum outside diameter of 4 inches, and the smaller will hold work to a maximum outside diameter of 2 inches.

Unit-type construction and the control of machine function by readily interchangeable sets of programming cams make the Centalign ideal for use in automated lines. To justify automation on an economic basis, large production runs and almost continuous operation on similar work parts are required to allow balancing the various manufacturing processes.

Feedback in several forms can be applied to the machine when specific job requirements merit its use. In its simplest form, work parts are fed from the machine to a trent gage where the work part size is measured. If the size drifts beyond acceptable tolerances, a signal is sent which stops the machine.

More complex forms of feedback can also be supplied. These either correct the machine after each individual error, or through the use of a process controller, feed back corrective signals founded on a statistical basis. • •

Aircore method saves $1242 on set-up wheel operations

Calculate the cost of operating one of your set-up wheel stations. Take 1/3 of that figure and you have the cost of doing the same jobs with Aircore Wheels. Your yearly savings per station can vary anywhere from $301 to $2184 depending on your present regraining costs.

Aircore Wheels are designed to perform the same jobs commonly done with set-up wheels. One large automobile manufacturer used set-up wheels to blend lead filling into rear fender contours. They switched to Model 535 Aircore Wheels using 36 to 48 grit abrasive bands. Not only did they realize considerable savings, but production was increased and a better finish was obtained.

Facts and figures are important, but they are of what others have done. How will Aircore Wheels work on YOUR jobs? How much will YOU save by replacing your set-up wheels with Aircore Wheels? You will know the exact answers when you put an Aircore to test.

DO SO AT OUR EXPENSE. Send for 25-day free trial. Give job requirements and type and size of power tools used. The name of your nearest Nu-Matic Distributor is available upon request.

N-115

Nu-Matic Grinders, Inc. • 8224 Carnegie Ave. • Cleveland 3, Ohio

Circle No. 229 on postpaid card

What's New in Equipment and Materials

Surface Finish Inspection Moves to Production Line

Manufacturers are discovering that considerable waste can be cut from the finishing operations by checking surface finish right at the machine, instead of in the inspection department. This practice eliminates the rejection of parts because of too coarse a finish. Equally important from the economic standpoint, it reduces another common loss, excessive finishing beyond the point necessary for proper functioning.

Many companies now use portable inspection equipment to check finish right at the machine, instead of the inspection department. They have found that, used in this way, portable finish inspection instruments are actually production tools. Their use makes it possible for the operator to set up his machine for proper tooling, speeds and feeds to produce optimum results. It also permits frequent quality checks during a production run, and thus provides prompt warning if the finish fails to meet specifications.

The portable instrument used is the Surfindicator manufactured by Brush Electronics Co., a division of Clevite Corp., Cleveland, O. It weighs only fifteen pounds and can be moved to any part of the plant, quickly and conveniently. It is used to measure surface roughness of metal, plastics, glass and vitreous ware, ceramics, paper and other materials.

Some users of this instrument have one at each production machine. Others place one Surfindicator in a spot convenient to each of a battery of machines, and operators bring a piece part to the

At Sterling Engine Co., the Surfindicator is used to check machined finishes without removing the piece from the machine.

This application at Behr-Manning Div. of the Norton Co., shows the versatility of the pick-up in checking the finish of cylindrical shapes.

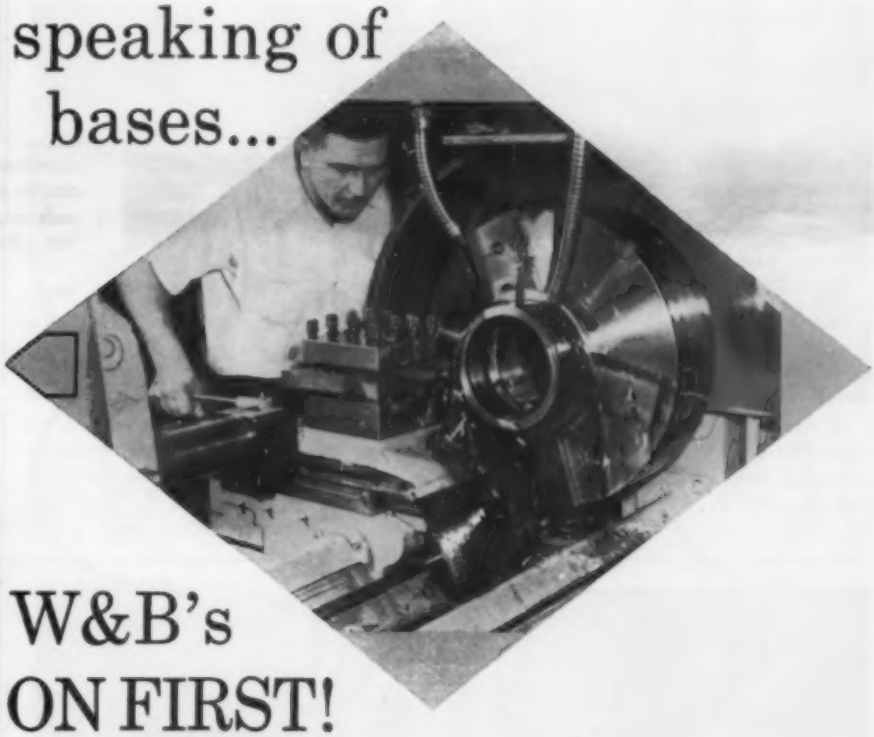
The Surfindicator is used to check shaft finish, while the shaft remains in the machine, at Metcut Research Associates.

Ingersoll Rand Co. uses the unit to check Navy pump shafts. It is used whenever drawings indicate micro-finish on parts.

instrument for testing. Even though it is moved from place to place frequently, it will retain its accuracy and sensitivity. The dial is calibrated in terms of the new ASA specifications, and the unit can be used on flat or curved surfaces, or to measure the internal finish of bores. •

Use HANDY Postpaid Card. Circle No. 101

speaking of bases...



W&B's ON FIRST!

W & B Base L, for instance, is the popular choice of top production engineers and shop superintendents where greater potency in cutting and grinding oils is required for certain operations.

When tool life and finish are not satisfactory, ready-mixed oils may be fortified with W & B Base L to produce the desired results.

Product of almost 70 years of White & Bagley industrial lubricant and coolant "know-how", Base L has an outstanding record of proven effectiveness.

Production men using a variety of cutting and grinding oils in quantity have found that they can slash costs and reduce inventory by using Base L to blend or to fortify oils for machining, grinding, drawing or stamping.

Base L, a sulphurized fatty base, carefully manufactured under close laboratory inspection and control, is but one of the available W & B Bases. Special Bases to meet unusual requirements will be prepared on order in minimum commercial quantities, without extra charge.

For more complete information on W & B Bases, write for catalog page B-1 or call in a White and Bagley industrial representative to discuss any phase of your industrial lubrication problems.

W+B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.

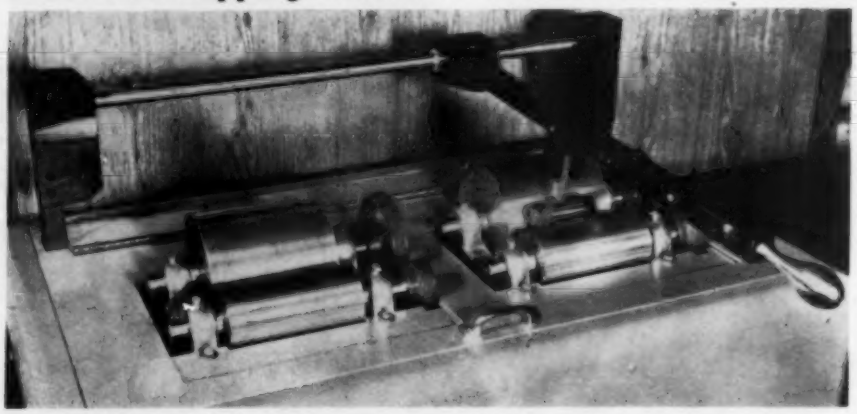
Established 1888

Worcester, Mass. Detroit, Mich.

Originators of Grinding Lubricants

Circle No. 230 on postpaid card

Centerless Lapping Machine With Hold-down Device



A centerless lapping machine designed to offer maximum ease of operation has been introduced by Size Control Co., 2500 W. Washington, Chicago, Ill.

Chief new feature of the unit is an easily manipulated hold-down device by which pressure is applied to the piece part being lapped or sized. With this device oversize bearings and gages, bearing races, bushings, shafts, and cylinders can be lapped to tolerances of .000010 inches (ten millionths) or less. It can also be used to salvage worn gages by lapping to the next smaller size.

With a far wider range of application than the ring lapping process, the new centerless lapper has three advantages over the older method: no parting line such as is left by ring laps; no time lost chucking and unchucking the work; and time and expense of making, storing, and renewing lapping rings is eliminated.

Lapping on the machine is done by means of two power-driven rollers, one considerably smaller than the other. The smaller roll turns at a constant speed the gage blank or piece part which is placed between the rolls. Pressure is applied to the piece part by the hold-down device. Formerly the machine operator had to apply pressure to the piece being worked with a small fiber stick.

Available as an accessory is an abrasive roll with handles attached, which is used to condition the lapping rolls without removal from the machine. In use the roll dresser is simply held between the revolving lapping rolls until the desired condition is attained.

By a simple adjustment to vary the space between the rollers, the machine will lap any diameter from .010 inches to 6.000 inches. The amount of pressure applied to the work piece governs the amount of stock being removed. High spots may be lapped by applying sustained pressure at those points and shoulders may be lapped on the machine by allowing the piece part to overhang the rolls of the machine.

Precision finishing of extremely hard materials such as carbide, sapphire, and boron carbide may be achieved by use of diamond lapping compound. •

Use HANDY Postpaid Card. Circle No. 102

Aluminum Oxide Cement For Electric Furnaces

A new aluminum oxide cement has been developed by Electro Refractories & Abrasives Corp. of Buffalo, N.Y., to provide a more heat-resistant, longer-lasting lining for indirect arc-type electric furnaces.

The aluminum oxide is said to hold up much better under high temperatures and slag attack than the mullite-base cements commonly used in these furnaces for melting ferrous and nonferrous alloys. The linings weigh from 500 to 1000 pounds. The material can also be used for patching existing furnace linings.

Known as Kellundite No. 8, the new cement is one of several being developed by Electro for furnaces in steel and brass foundries. •

Use HANDY Postpaid Card. Circle No. 103

All Makes • Types and Sizes High Speed
Precision Boring and Grinding (including Hi-Cycle Units)

SPINDLES REPAIRED

IN HOURS . . . NOT WEEKS!

Also Anti-Friction Live Centers Restored to Original Accuracy

Air conditioned repair center, trained mechanics and immediate availability of all types of bearings required in these units. We guarantee satisfaction and prompt service!

Bearings, Inc.

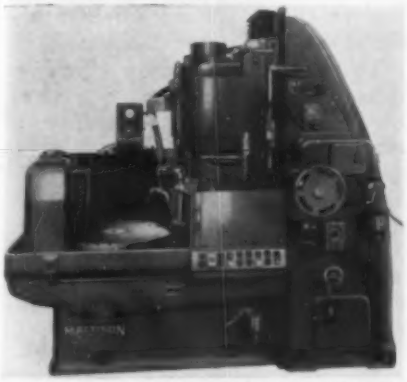
3640 EUCLID AVENUE • CLEVELAND 15, OHIO

Branches in OHIO • INDIANA • PENNSYLVANIA
WEST VIRGINIA • NEW JERSEY • KENTUCKY

Gentlemen:
I'd like to have complete information on your spindle repair service.
Name
Firm
Address
City Zone State

Circle No. 231 on postpaid card

New Design Features For Surface Grinders



Mattison Machine Works of Rockford, Ill. has recently redesigned its Models 24 and 36 vertical rotary surface grinders to increase stock removal rates and accommodate new types of work requiring closer tolerances.

Automatic cycling is available on these high-powered surface grinders through the use of one of two automatic systems that may be installed at extra cost. Either system will provide pushbutton actuated automatic cycling which includes: switching on the coolant pump; moving the table into grinding position; magnetizing the table and starting it rotating; feeding to size, according to gauging system; sparking out; and returning all elements of the machine to loading position. The air-gauging system measures the work continuously and gives the operator visual indication that parts are approaching size. The micro-switch automatic sizing system is an electro-mechanical measuring device which measures the work continuously and actuates the automatic cycle at the completion of the grind. The machine is then ready for the next load.

A new continuous down feed system eliminates troublesome mechanical linkages found in ratchet-type feeds and increases the range of feeds. Thus, it is possible to split the last increment normally obtained when using a ratchet feed. There's no limit to the feed rate because the time delay necessary for linkage actuation has been eliminated. On many jobs horsepower and wheel capacity are the only factors limiting the feed rate, making it possible to increase production.

Two spindle drive systems are offered on the new grinders. One is the standard built-in-drive with semi-enclosed motor. The other system is a coupling-type drive with standard TEFC motor which meets JIC standards and is particularly suited to large shops which customarily replace motors from stock. A new venting method has been applied to the motor to prevent coolant mist from being drawn into it and causing damage. •

Use HANDY Postpaid Card. Circle No. 104

16 PRESIDENTS AGO!

we started business

We started business when Grant was President of the United States.

Thru major wars, depressions, recessions, panics, floods, and political upsets we have served industry with the very best in grinding wheels.

You've got to be good to set up a record like that!

Write for details or the name of your nearest distributor.

DAYTON SAFETY GRINDING WHEELS

SIMONDS WORDEN WHITE COMPANY

SWWCo

1101 Negley Place • Dayton 7, Ohio

Circle No. 232 on postpaid card

New Line of Small Abrasive Cloth Wheels

A new line of small PG wheels, designed for polishing metal with portable hand tools, has been announced by Minnesota Mining and Manufacturing Co., Dept. F6-99, 900 Fauquier St., St. Paul 6, Minn.

The wheels, which have the same basic design as the company's large polishing and grinding wheels introduced last fall, are composed of die-cut pieces of coated abrasive cloth, bonded with resin and locked into a hub.

The new wheels are particularly suited the 3M Company believes for work in the appliance, stainless and sheet steel fabricating, metal polishing, plating, and tool and die industries, replacing small set-up wheels. They are intended for rust or dirt removal, blending patterns left by disc sanders, weld polishing, featheredging for spot painting, and similar polishing operations.

Small PG wheels are especially suited for polishing soft metals such as lead and solder because the coated abrasive cannot become filled. The mineral grains and the backing wear away together, presenting an always-new surface to the work. This action assures a constant polishing pattern, since mineral grains never become dull; and the rate of cut is constant through the life of the wheel.

The new coated abrasive wheels are designed for use on portable grinders, flexible shaft equipment or small bench-type grinders. They are available in 6″ to 10″ diameters, with 1″, 1½″, 2″ and 3″ face widths, and in an 11″ diameter in 2″, 2½″ and 3″ face widths. The wheels are currently being made with aluminum oxide or silicon carbide mineral on a cloth backing, in grits ranging from 50 through 320. •

Use HANDY Postpaid Card. Circle No. 105

Exhaust Silencer for Dust Collectors

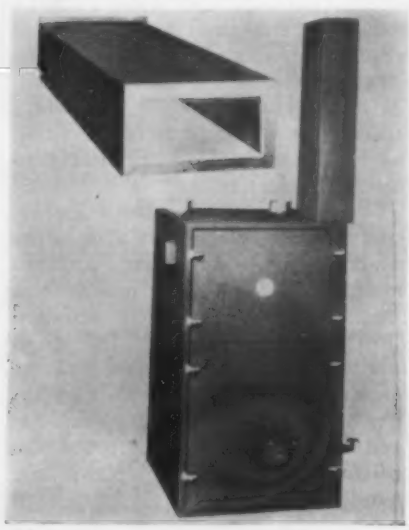
Intended for use wherever extra quiet operation is desired on Torit cabinet-type dust collectors is the new exhaust silencer, a product of Torit Mfg. Co., Dept. KP, 287 Walnut St., St. Paul 2, Minnesota.

The silencer is available in five models to fit the exhaust openings on the 50, 60, 70 and 80 series and the model 122 collectors. Although all Torit dust collectors are designed to run quietly, some applications require even greater noise suppression for employee comfort and operating efficiency.

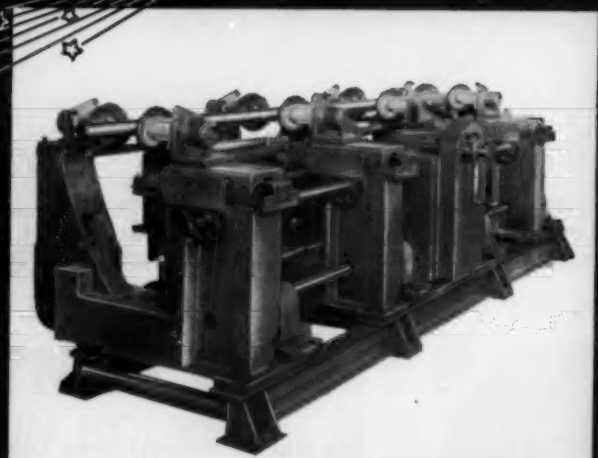
The three smaller models are made of 20 gauge steel and extend 30″ above the top of the collector to further reduce the noise effect; larger two models are built of 16 gauge steel and extend 36″. All five are rectangular in cross-section and are interlined with 1″ closed cellular vinyl foam that is said to absorb approximately 80% of the noise without restricting air flow.

All silencers are given a baked-on wrinkle finish to match the Torit cabinets. They can be readily attached to new Torit units at the factory or to collectors now in use. •

Use HANDY Postpaid Card. Circle No. 106



Production



HEAVY DUTY TYPE
for Work to 8" diameter

Power Driven
Work Supporting and Feeding Fixtures

For feeding Centerless Grinding machines, heat treating ovens or for inspection of bars or tubes of all sizes and weights, Production Machine Co. has a wide variety of power driven feeding fixtures available.

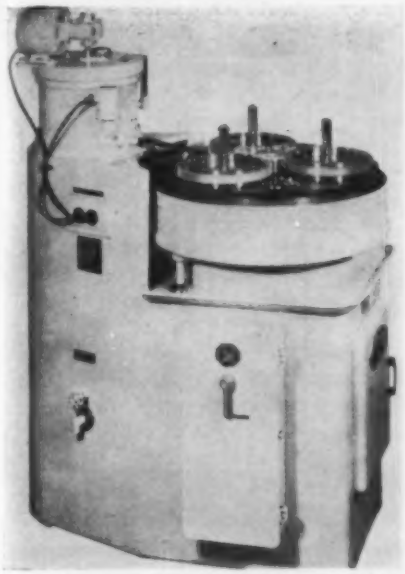
These fixtures have vari-drive motors adjustable for rotation and traverse rates. Traverse direction may be reversed manually or mechanically.

Production has a type and size for your requirement. Write Dept. G for full information.

PRODUCTION MACHINE CO., Greenfield, Mass., U.S.A.

Circle No. 233 on postpaid card

Precision Automatic Flat Lapping Machine



Engineers at Spitfire Tool Co., 2931 N. Pulaski Rd., Chicago 41, Ill., have designed and developed a precision automatic flat lapping machine, known as the Gyro-Matic 21. It was primarily developed to eliminate a laborious, uncertain lapping process and also to lower the cost of manufactured parts through production lapping.

A removable, circular tank with a removable cover for easy cleaning is used along with a heavy duty aluminum paddle with neoprene inserts, driven by a gear reduced motor to keep abrasive and vehicle in correct suspension. A metering valve is used to control the proper feed of abrasive to the lapping plate, and a solenoid valve is used to automatically control the abrasive flow, as required.

A precision finished, special alloy close-grained cast iron, properly heat treated plate is used. It is slotted with angular grooves to provide a quicker lapping action and the disposal of spent abrasive.

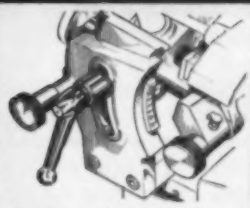
Gear retainer rings and center drive gear assure positive counter-motion of parts against the rotation of lapping plate with a simulated figure 8 motion.

A thermo setting plastic plate retains the above mechanism and this plate contains an arrangement for quick parts removal and also provides a dust free protection for the lapping plate.

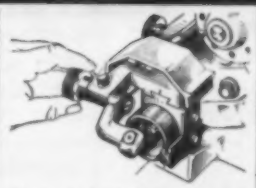
A main drive, totally enclosed motor of ¾ hp, heavy duty, 220/440, 1800 rpm is used. Agitator motor is a 1/12 hp, 86 rpm.

To the production engineer it means no down time on production lines, due to the constant resurfacing and truing of the lapping plate by the gear retainer rings. •

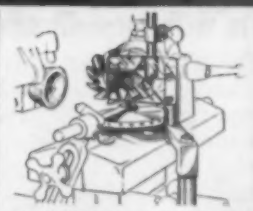
Use HANDY Postpaid Card. Circle No. 107



Clearance Angle Scale — clearance angles are read directly from a graduated scale on the wheel spindle assembly.



Mechanical Wheel Dressing — an accurate radius is mechanically dressed on the grinding wheel in correct relationship to self-registering tooth rests.



Parallel Gage — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage.

Here is a completely NEW method for grinding helical cutters...

It's name is

END MILL CENTRA-POINT GRINDER ®

It can save you time in sharpening

END MILLS
PLAIN MILLING CUTTERS
SHELL END MILLS
STAGGERED TOOTH CUTTERS
CHUCKING REAMERS
COUNTERBORES, ETC.

CENTRA-POINT'S new ball bearing carriage and work-head allow sensitive movement necessary for following helixes of small milling cutters.

Free folder tells the whole story

CENTRA-POINT DIVISION
William H. Field Co., Inc., 331 Dorchester Ave., Boston 27, Mass.

Please send the complete CENTRA-POINT story, at no obligation.

Name _____ *Title* _____
(Please print)
Company _____
Address _____
City _____ *Zone* _____ *State* _____

Circle No. 234 on postpaid card

Monorail Blast Cleaner for Parts with Internal Chambers

Wheelabrator Corp., Mishawaka, Ind., has announced its new UB Wheelabrator monorail-type blast cleaner. This machine is intended for handling cleaning problems involving parts with internal open cavities that are difficult to clean completely. A typical application is the cleaning of cast automotive engine blocks. Another is the etching cleaning of welded water heater tank shells before glass lining or porcelain enameling.

The new machine, an airless abrasive blast cleaner, differs from older and conventional designs in that more efficient use is made of the blast cleaning abrasive. This results in less abrasive use. Fewer centrifugal abrasive-hurling units are required, so power costs are reduced. The total result is lower cleaning cost per part.

The new design places the work to be cleaned in such a position that cavities are exposed to the abrasive shower from a single hurling wheel during the entire period the piece is in blasting position. Conventional designs have permitted critical areas to be subjected to the blast from a single wheel only about a quarter of the time the part is in position.

Photographs show a comparison of the new and old designs. First photo shows the older and conventional design for monorail blast cleaners for cast automotive engine blocks. Each hook carries one block and rotates in the blast. Six abrasive-hurling wheels are employed, because the critical crankcase and valve cavities receive the blast of each wheel only about a quarter of the time.

In the newer design, second photo, the crankcase cavity gets the abrasive blast from one wheel during the block's entire rotation. The valve section and the easy-to-clean sides of the block are exposed to two hurling wheels in the cabinet sidewalls.

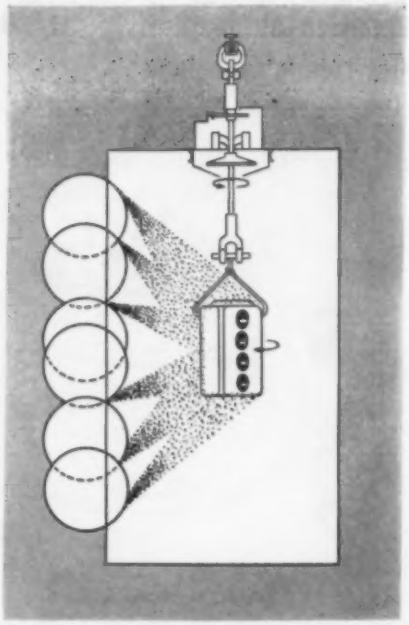


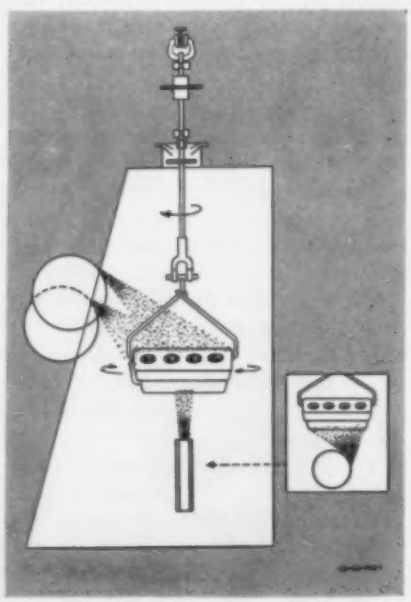
Photo shows conventional design replaced by new UB monorail blast cleaner.

Among other new design developments in this Wheelabrator machine are double chain drives to increase rigidity of the work-holding hooks on the conveyor. This reduces the swaying of work in the blasting compartment that has a tendency to result from the force of the blast.

Another development is the use of newly designed traveling seals for more efficient prevention of abrasive leakage around the monorail conveyor mechanism. ●

Use HANDY Postpaid Card, Circle No. 108

Photo shows principle of new UB cleaner.

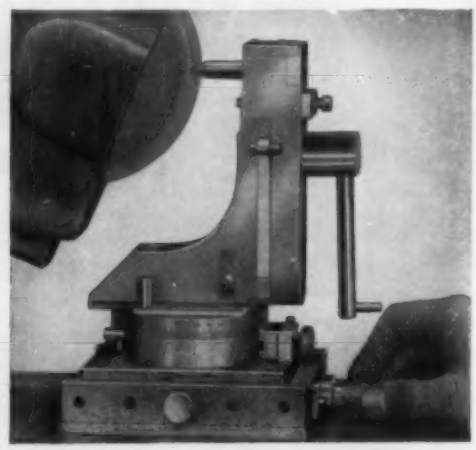


Tough Grinding Wheel Forms Dressed Easy as A, B, C

eliminate elaborate set-ups and operations

.0001" ACCURACY

Fluidmotion
WHEEL DRESSERS
dress two angles tangent to a radius in one continuous motion



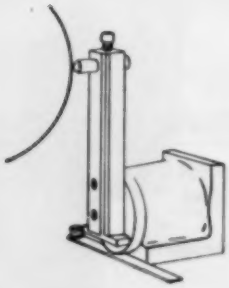
With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.

Adaptable to all type cylindrical and surface grinders.

A. Obtain micrometer reading; add required convex radius or subtract required concave radius.

B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.

C. Tighten jib. Set stops for two angles. Ready for action.



Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave.

WRITE FOR INFORMATION ON THE NEW J & S PURCHASE PLAN
See your industrial distributor or write for free literature.

J&S TOOL CO. INC. — CLAMPCUT

J & S TOOL CO., INC. | 871 DORSA AVE. LIVINGSTON, NEW JERSEY

Circle No. 235 on postpaid card

Oscillating Dry-Abrasive Cutter

Of heavier construction than previous models, this high-speed dry-abrasive cutting machine, designated Model 28 Sever-All, has a capacity to handle solid steels up to 4 in. square, 6 in. angles and 8 in. channels at 90 deg. to axis. These specifications are based upon using an 18 in. diameter Allison abrasive cutting wheel, a 10 hp motor and a spindle speed of 2,450 rpm, according to its manufacturer, the Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn. The device is available in both stationary and portable models for cutting sheets, angles, channels, pipes, bar stock, tubes and solids of practically all analyses.

The Sever-All is an oscillating type unit in which the wheel and work are fed manually. With oscillation the amount of abrasive wheel contact is reduced and cutting is performed with a minimum of pressure on the wheel.

A double-acting work holder automatically positions the material being cut in the center of the support, and is clamped at both sides by a hand-operated crank handle.

The machine's pedestal is of welded steel construction, its top is of solid steel plate and is reinforced under the swing arm bracket.

Its spindle, of forged alloy steel, is heat-treated, precision ground and dynamically balanced. Each end of the spindle housing has labyrinth sealed type caps to prevent entrance of dirt and retain lubricant. Abrasive wheel guards of steel are designed for maximum operator safety by totally enclosing the cutting wheel during the cutting operation except for openings on the sides of the guard to clear the work.

The Sever-All measures 56 in. front to back, 32 in. left to right, and 62 in. high. Net weight without electrical equipment or accessories is 1,200 lb. Approximate weight with electrical equipment is 1,400 lb. •

Use HANDY Postpaid Card. Circle No. 100

. . . and you can change your method of cylindrical grinding to obtain MICRO-FINISH with POSITIVE ROUNDNESS!

The RED-E new grinding concept is so graphically an improvement over conventional methods that even the 'die-hards' are changing over. Old-timers throughout the country have convincing proof that chatter, wheel-marks, out-of-roundness and costly secondary operations can be eliminated and controlled . . . that roundness is only as accurate as the Center hole alignment. With RED-E they now achieve super-finishes in cylindrical grinding!

Send for the new RED-E Concept Booklet! It explains how you can obtain the ultimate in grinding accuracies to within less than 50 millionths (0.000050") t.i.r.

Mail Coupon Today

READY TOOL CO.
566 Ironistan Ave., Bridgeport 5, Conn.

Gentlemen:
Please rush ( ) copies of your Concept Booklet.
☐ May we have your new Center Catalog, too, please?

Name _____
Address _____
Company _____
City _____ Zone _____ State _____

Circle No. 236 on postpaid card

Liquid Chiller Uses Water Only as an Auxiliary Measure

The Lundholm Mfg. Co., 1121 Charles St., East Rockford, Ill., is now featuring combination air and water cooled electric refrigerated liquid chillers for cooling liquids such as coolants and hydraulic oils.

This model gives the industrial user a tandem system using water only as an auxiliary in excessive high production or extra hot weather.

When operating under normal conditions only air is used as a cooling medium for dissipating heat. When pressures exceed beyond normal operation on the air cooled radiator, water enters the system relieving excessive high pressures automatically. As the pressure decreases the water is automatically shut off. This system is recommended in localities where water is scarce, or where the present drain systems are used to their near capacity. The Lundholm Liquid Chiller eliminates large reservoirs which take up expensive floor space.

With proper balanced chillers, temperatures on coolants can be held to a given temperature all day long, assuring an increase in production and giving longer life to the tools. •

Use HANDY Postpaid Card. Circle No. 110

200 Gallon Magnetic Separator and Filter

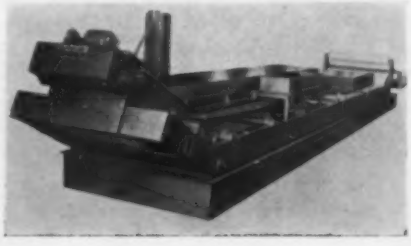
A new Delpark 200 gallon magnetic separator and filter is now available for filtration processes requiring large flow capacities.

The largest of its kind manufactured, this unit is unique in the removal of sludge and abrasives by the use of a flat magnetic field of Alnico No. 5 permanent magnets. The ferrous laden liquid flows over this magnetic field diffusing liquid and particles, thus assuring complete exposure to the magnets. Such diffusion automatically doubles the magnetic field making possible the liquid depth being held to a minimum. Particles which would normally remain suspended in heavy viscosity liquids are brought into more positive influence of the magnets. Assisted by the natural force of gravity and low velocity flow, efficient separation of ferrous sludge and abrasives is assured.

Certain particles such as wheel abrasives do not respond to a magnetic field. For maximum efficiency, Delpark has combined the magnetic separator with the Delpark paper filter. Particles remaining in the liquid after contact with the magnetic field pass down to the filter material which rests on a flat endless conveyor. The liquid filters through this material by gravity and the particles remain on the surface forming an efficient filter bed. Constant sludge removal is effected by the use of automatic chain-driven, rubber-bladed flights which carry the sludge up a ramp and deposit it into a tote box for disposal.

Magnetic separators are also available without the combination paper filter feature in capacities from 5 to 200 gpm. Industrial Filtration Company, Dept. 200-290, Lebanon, Ind. •

Use HANDY Postpaid Card. Circle No. 111



Selecting diamond tools made easy with NEW...

DTR INDUSTRIAL DIAMOND PRODUCTS CATALOG

The new DTR Diamond Products Catalog is a valuable asset to anyone who buys and uses diamond tools, diamond powders and compounds, or plated mandrels. Complete descriptions of the DTR methods of grading diamonds and detailed blueprints of more important tools are provided along with a special chart to help you choose the right diamond tool for every turning, dressing and trueing application.

Also included in a section showing the 3 basic reasons why DTR diamond powders and compounds excel — and when, where and how to use each.

All this plus scores of other illustrations, diagrams and informative articles make the new DTR catalog a fact filled guide that can help you save money by helping you to buy right.

Send For Your FREE Copy Today

DTR

DIAMOND TOOL RESEARCH CO., INC.

380 Second Avenue, New York 10, N. Y. GRamercy 5-3530

DIAMOND TOOL RESEARCH CO., INC.
380 Second Avenue
New York 10, N. Y.

☐ *Please send me your new Catalog*

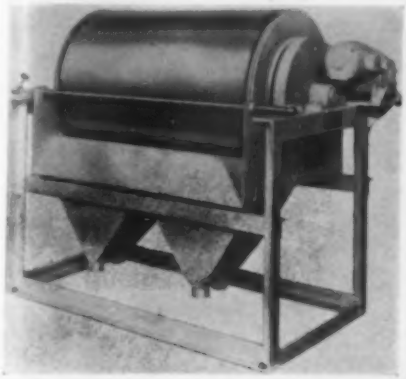
☐ *Please have your representative call*

Name .....
Title .....
Company .....
Address .....
City ..... State .....

SPECIALISTS IN INDUSTRIAL DIAMOND PRODUCTS

Circle No. 237 on postpaid card

New Drum Separator for Heavy Media Plants



Stearns Magnetic, Inc., Milwaukee, Wisconsin, recently announced the development of a new wet drum magnetic separator.

Called the WPD, the separator is a powerful wet drum permanent magnet unit designed for efficient recovery of media in heavy density plants. The specially designed magnet provides correct flux distribution for positive transport of the collected magnetics to the discharge point. Powerful Alnico permanent magnets are used requiring no external energization—eliminating cost of rectifier of motor generator set.

Use HANDY Postpaid Card. Circle No. 112

WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use

$89.95

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION

333 Nassau Avenue Brooklyn 22, N. Y.

Circle No. 238 on postpaid card

Magna-Lock chuck holds six tapered gibs during roughing operation.

PRODUCTION UP 25%

with

ELECTRO-MAGNETIC

Magna-Lock

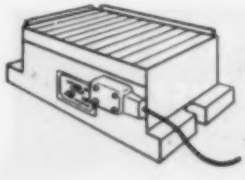
CHUCK

Magna-Lock chuck holds gib during finish grinding.

At Gisholt Machine Company, roughing and finishing operations on 24" tapered gibs are done on a surface grinder. The gibs are held by a Magna-Lock chuck and are rough ground six at a time and finish ground individually. Spindle and table speeds for both operations is 1200 r.p.m. and 100 f.p.m. respectively. Stock removed is .020" to .025". There is no scrap, no rejects. Fixture set-up time is eliminated. Since using the Magna-Lock chuck, production has increased 25%.

This is one of the many examples of how the *extra holding power* of Magna-Lock all-steel, all-welded electromagnetic chucks steps up production, reduces costs.

Solve your holding problems with Magna-Lock magnetic chucks—a complete line to meet your requirements. WRITE TODAY, Dept. GF-76.



Hanchett MAGNA-LOCK CORPORATION

BIG RAPIDS, MICHIGAN, U. S. A.

designers and makers of a complete line of magnetic chucks and devices.

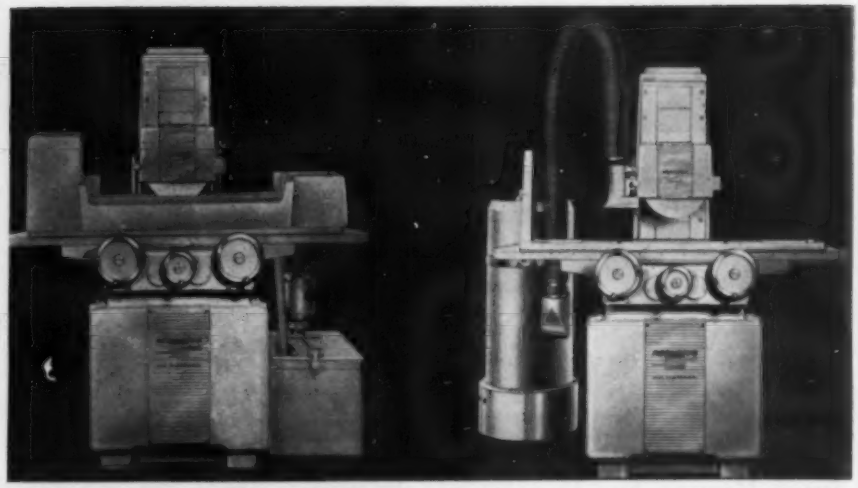
Circle No. 239 on postpaid card

Small, Rugged, Precision Surface Grinder

Abrasive Machine Tool Company, East Providence, Rhode Island, has announced an entirely new precision surface grinder, the Abrasive 618. Three innovations highlight the new grinder . . . new size, new design, new features, all engineered for easy precision accuracy.

The new size, 6″x18″x12″, is in keeping with today's industrial demand for a small, yet rugged, precision surface grinder that's easy to operate and maintain.

To provide positive grinding control, new roller-bearing ways, a back-lash eliminator on the saddle feed and a table cable and drum drive have been incorporated in the No. 618 design. Advantages of all three features have been proven in rugged testing which involved over one million reversals under actual work loads.



Left photo shows the Abrasive 618 equipped with a wet grinding attachment. Right photo shows the 618 with an Abrasive Dustnaire filterless dust exhauster and separator. Both attachments are available at extra cost.

For operator convenience and efficiency, all controls are on the same waist-high plane, and hand wheels are recessed for comfort.

The 618 saddle is a special close-grain, stress-relieved casting. Full 5″ depth of saddle box construction prevents distortion or warping even at 50% overload. The spindle is of wide diameter cartridge design and is totally enclosed, dynamically balanced and lifetime lubricated. The 618 is equipped with either a 12″ grinding wheel powered by a 2 hp, 1750 rpm motor or a 7″ grinding wheel with a 1 hp, 3450 rpm motor. •

Use HANDY Postpaid Card. Circle No. 113

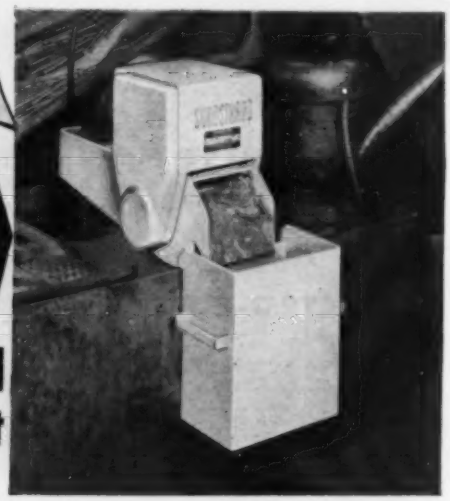
Flexible Coated Abrasive Wheel Features Smaller Diameter

Merit Products, Inc., 4023 Irving Pl., Culver City, Calif., has announced a new, smaller diameter Grind-O-Flex, a flexible coated abrasive wheel for contour grinding and polishing. Formerly made in 6″ to 17″ diameters, and 1 to 3″ widths, the new model is only 3″ in diameter, 2″ in width and in various grits from fine for polishing and buffing, to coarse grits for deburring, smoothing flash and chamfering. The new 3″ diameter is for sharp bends, contours of small radii and confined areas such as the inside of tubing. It mounts on any spindle or chuck of present portable or stationary equipment. •

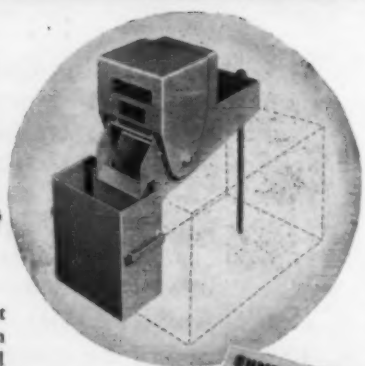
Use HANDY Postpaid Card. Circle No. 114

$1927.12 SAVED PER YEAR

...with Sundstrand Magnetic Coolant Separator



Installation of a Sundstrand Magnetic Coolant Separator on a grinder, as shown above, resulted in a yearly saving of $1927.12. Further, instead of cleaning the coolant tank twice daily, it now requires cleaning only *twice weekly*. Cost of the installation is approximately $495.00. The unit requires no attention and little or no maintenance.



Easily Installed Without Additional Piping

An important feature of this magnetic coolant separator is that it can be dropped into position on most open type coolant tanks. No additional piping is required. Install one on your present equipment and compare its efficient operation with other units.

Free Additional Data

This folder will give you the complete facts on the Sundstrand Magnetic Coolant Separator. Write for your copy today. Ask for bulletin 468-M.

SUNDSTRAND POWER-GRIP ®

SUNDSTRAND Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1090-9th ST • ROCKFORD, ILLINOIS

Circle No. 240 on postpaid card

Four Cubic Foot Tumbling Barrel

Rampe Mfg. Co., 14915 Woodworth Ave., Cleveland, Ohio, has announced the Model V-4 unit which has a versatile, hexagonal 4 cu. ft. tumbling barrel, 23" dia. x 21½" long—supported at each end and adequately powered for steel ball burnishing. Power is furnished by a ¾ hp 220/440 volt, 3-phase motor with either variable or fixed speed drive.

Barrels can be unlined or lined with No-seam vinyl plastic for extreme wear and chemical resistance.

The line of barrel finishers now has models available from one gallon to 8 cu. ft. capacity. •

Use HANDY Postpaid Card. Circle No. 115

CLIPPER

PRECISION DIAMOND TOOLS

Industrial Diamonds
Thread Grinders
Turning Tools
Engraving Tools
Dressing Tools
Diamond Powder

Manufacturers of
DIAMOND TOOLS
and
WHEELS

BRANCH OFFICES

CINCINNATI, STEVE URBAN, 122 Springfield Pike

CLEVELAND, BILL WIESE, 8905 Lake Ave.

DETROIT, FLOYD BEARSS, 1433 Northwood Blvd., Royal Oak, Mich.

INDIANAPOLIS, IVAN STRANGE, 33 Tyler Ave., Greenfield, Ind.

PHILADELPHIA, H. J. MILLER, Valley Brook Rd. and Glen Mawr Dr., Ambler, Pa.

ROCHESTER, N.Y., DON GINEGAW, 10 Oak Manor Lane, Pittsford, N.Y.

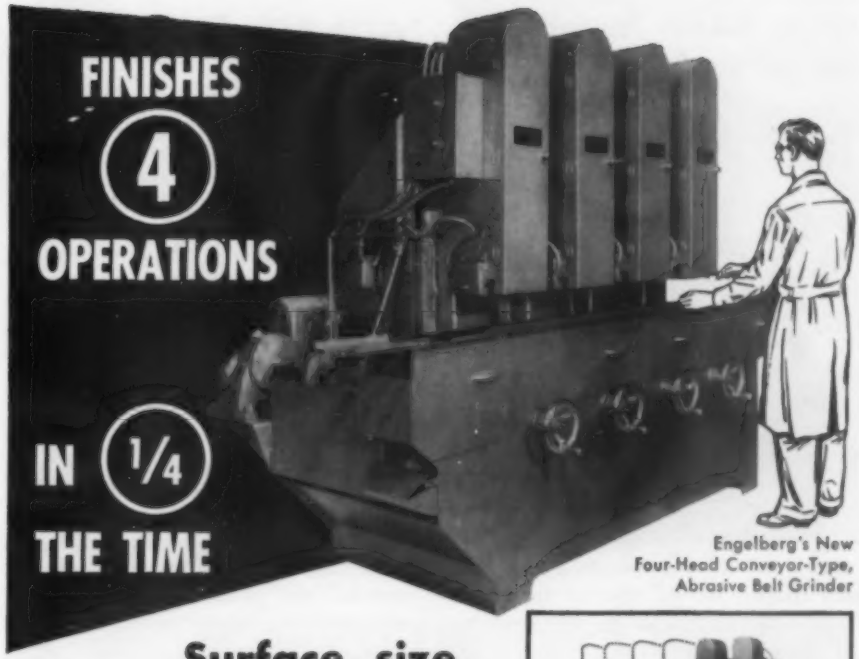
SYRACUSE, N.Y., BARNES & JORDAN, INC., 409 E. Jefferson St.

Representatives in Principal Cities

CLIPPER DIAMOND TOOL CO., INC.

345-E HUDSON ST. NEW YORK 14, N.Y.

Circle No. 241 on postpaid card



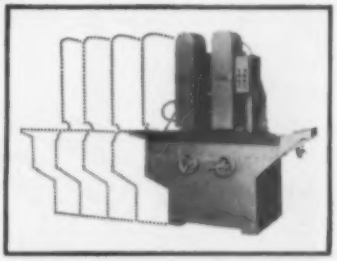
Engelberg's New Four-Head Conveyor-Type, Abrasive Belt Grinder

Surface, size, Semi-finish, Fine Polish... in ONE Pass!

Talk about high speed production. You will — when you see Engelberg's new multi-head conveyor-type abrasive belt grinder precision size and fine finish *any* ferrous, non-ferrous, plastic or other flat surface. *With one machine — one operator — and one pass* — you can now complete *four* different grinding and polishing operations.

Think of the costs you can slash on high-volume runs. Think of the time you can save on set-ups and changeover. And the initial cost is far less than you'd have to pay for separate machines.

SEND SAMPLE PART TODAY for cost-and-time-savings estimate. Or if more convenient, an Engelberg Production Engineer will be glad to discuss your grinding problems. No charge — no obligation, of course.



Choice of 1 through 6 grinding heads with 6", 8", 10" or 12" belt width.

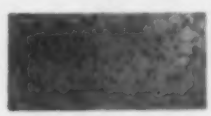
Parts Finished in ONE Pass

Chain Saw Bars — 4 head operation removing .004" per head for total .016" per pass with conveyor belt speed of 6' per min.

Roger Dean FORD

Name Plate — 3 head operation using #240, #320 and #500 grit abrasive belts with conveyor belt speed of 14' per min.

Skate Blades — 5 head operation using #120, #180, #240, #320 and #500 grit abrasive belts at 12' per min. conveyor belt speed.



Rubber Tile — 3 head operation using #240, #400 and #600 grit abrasive belts with conveyor belt speed of 21' per min.

ENGELBERG

HULLER CO., INC.

327 Seneca St. Syracuse, New York

Circle No. 242 on postpaid card

Lapping Machine for Carbide and Ceramic Cutting Tools

Designed to rapidly produce micro-inch finishes on all types of tungsten carbide and new ceramic cutting tools

is a new lapping machine announced by Di-Met Corp., 1873 Mullin St., Torrance, Calif.

The carbide Micro-Inch finisher is equipped with two removable rotating Meehanite laps of 6" diameter. These are charged with Di-Met diamond compound. Tools are held on either of the two tilting tables and reciprocated slowly across the face of the lap. In a matter of two minutes or less a rough-ground tool can be brought to a perfect edge—straight and smooth to a finish of ½ to 6 microinches, depending upon grade of compound used. Using this technique, considerable time is saved and several operations are eliminated.

The machine has a removable head, permitting unit to be used on either bench or pedestal. The pedestal is equipped with shelf for storage of compound, and a lock and key on door is provided for protection against unauthorized use. Accessories include a flexible shaft unit for buffing lapped edges to a mirror finish. •

Use HANDY Postpaid Card. Circle No. 116

Oscillating Carbide Tool Grinder

The new Hammond Model OCE-6, oscillating carbide tool grinder, is adapted for either conventional grinding or, connected to a power pack, for electrolytic grinding.

The outstanding feature is the oscillating spindle, relieving the operator of the effort of manipulating the tool. The tool is held in stationary position, while the oscillating wheel does the work for him. In addition to elimination of manual effort with consequent time saving, the oscillating spindle assures uniformly flat grinding, and makes possible longer life for the diamond wheel, as the face is being uniformly worn and frequent dressings are not required.

Spindle is precision engineered with heavy-duty construction, with the entire spindle assembly dynamically balanced. It oscillates on a tapered roller bearing rocker, resistant to end and radial thrust.

Wheel oscillation has two variables . . . oscillations per minute and length of stroke. Both are controlled by handwheels located on the front of the machine for operator convenience. Oscillations can be adjusted between 0 and 70 per minute. Length of stroke, or amplitude, can be varied to accommodate tools from ¼" to 2" face, using a ¾" face diamond wheel.

V-belt drive is from 1 hp motor. Self-contained unit accommodating either conventional coolant or electrolytic solution is mounted inside the base. Outlets in hood provide for complete mist removal when connected to a Hammond MistKolector. Hammond Machinery Builder, Inc., 1651 Douglas Ave., Kalamazoo, Mich. •

Use HANDY Postpaid Card. Circle No. 117

THEN WHY USE AN EXPENSIVE BIG MACHINE FOR MEDIUM SIZED WORK?

USE *New*

ROYAL MASTER

Centerless Grinder

GRINDS 3/64" TO 11/2" SIZE RANGE

INEXPENSIVE TO OWN—PROFITABLE TO USE

GET ALL THE FACTS

Write today for our 6 page descriptive brochure, illustrating and describing in detail the *Royal Master* Centerless Grinder, and showing examples of its work. No obligation.

The new, low cost *Royal Master* Centerless Grinder will grind stock throughout the popular 3/64" to 1½" range with an accuracy not available in many larger machines.

Tolerances of .0002 are readily held. 6-8 microfinishes are easily obtained.

For grinding shapes up to 1½", the *Royal Master* Centerless Grinder offers high production combined with accuracy, plus low initial cost, low depreciation, maintenance, and other overhead costs.

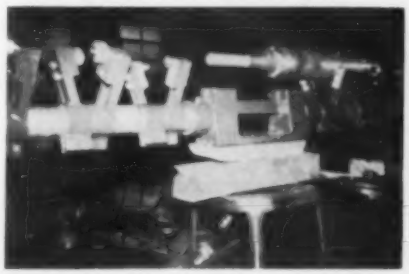
ROYAL MASTER INC.

200 State Highway 23, Riverdale, New Jersey

Circle No. 243 on postpaid card

Bar Stock Fixture

A new low priced centerless bar stock fixture, has been recently developed by the Alco Mfg. Co., 318 E. 10 Mile Rd., Hazel Park, Mich. This is a roller type fixture that will take stock sizes from ¼" OD to 12" OD at any desired lengths.



Its steel construction has replaced older type fixtures made from cast iron. The thru feed fixture and the tripods are supplied as a part of the unit and at no extra cost. These fixtures are also made to customers' specifications, and all units are on approximately three weeks delivery schedule. •

Use HANDY Postpaid Card. Circle No. 118

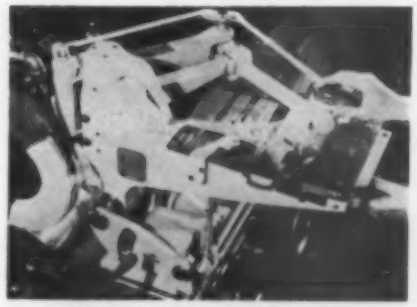
New Form Truing Attachment For Cylindrical Grinders

Pratt & Whitney Co., Inc. of West Hartford 1, Conn., has announced a new form truing attachment designed particularly for use on universal internal and external cylindrical grinders. Known as the Diaform Model No. 10 Universal, the new attachment supplements the present line of surface grinder type Diaforms.

Like all Diaform models, this new Model No. 10 makes it possible to form-true complex contours on grinding wheels accurate to "tenths" in a matter of minutes. Equally accurate repeat truings can be made as often as required.

Mounted on the grinding machine table by an auxiliary carriage, the unit is well out of the way during grinding operations, but is quickly available for re-truing without disturbing the work piece. The auxiliary carriage provides vertical adjustment for centering the truing diamond to the grinding wheel to suit different makes of machines.

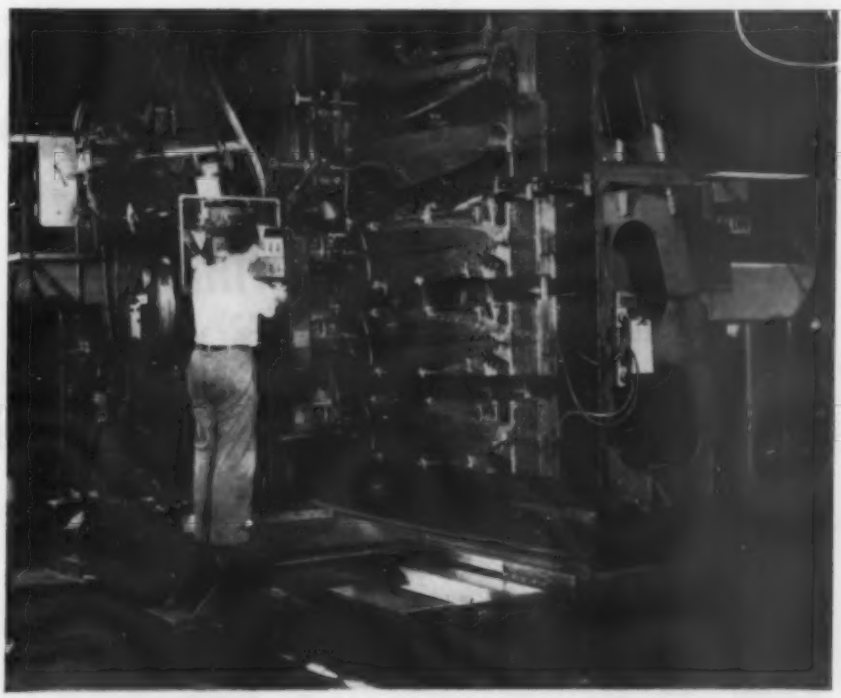
In operation, a tracer is lightly traversed over the profile of an enlarged template of the desired form. Path of the tracer is transmitted at a 5:1 reduction ratio, which reduces any template error by the same ratio, to a truing diamond that accurately reproduces the form in the grinding wheel. Since a sharp diamond is used, the wheel is



dressed as it is form-trued. Maximum diameter of grinding wheel that can be formed is 14"; maximum width of form produced on the wheel is 2"; maximum depth of form is 1". •

Use HANDY Postpaid Card. Circle No. 119

Walker Does it Again-



Three WALKER electro-magnetic chucks mounted on milling machine, making possible profile milling three propeller blades in one operation.

WALKER engineers and makes chucks for unusual applications as well as standard holding devices for irons and steels, non-ferrous metals and non-metallic materials.

Whatever your holding problem the originators of the magnetic chuck will solve it for you.

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

IN CANADA—UPTON BRADEEN & JAMES, LTD.

Circle No. 244 on postpaid card

Steel Grit Abrasive Proves Ability in Tests

Photo shows one of the five airless abrasive blast cleaning machines used in the test.

Recent tests showed that reduced equipment maintenance, reduced abrasive consumption and faster cleaning result from the use of steel grit in blast cleaning of heat treated parts. The tests were conducted by Commercial Steel Treating Corp., Detroit, Mich., using media and equipment manufactured by Wheelabrator Corp., of Mishawaka, Ind. This large job heat treating company has five airless abrasive blasting machines to handle the variety of work that needs to be cleaned. All use grit as the abrasive to provide the finishes required by the customers.

The company first made performance tests with chilled iron abrasives they had been accustomed to using. Subsequent tests were made with carbide-free steel grit. Although steel grit has high hardness to penetrate the toughest of scales, its metallurgical structure can resist breakdown; the particles keep their size, shape, mass, and usefulness longer. Tests with steel abrasive showed a reduction of as much as 73.8% in consumption. Wheelabrator Corp. size GH-50 Steeletts grit was used in this test.

Maintenance savings stem from the fact that steel grit particles are specially heat treated for toughness and so do not chip away upon impact. This eliminates the sharp edges that cause excessive wear on a blast cleaning machine.

Helping make possible the faster service of this job shop is the fact that cleaning time is now reduced. This occurred because ventilation of the blast cleaning chamber could be increased. Scale that contaminates the abrasive decreases cleaning efficiency. But ventilation formerly had to be kept lower because the abrasive broke down so rapidly into small particles. Higher ventilation then would have removed the small particles from the machines before their complete effectiveness was utilized. •

Use HANDY Postpaid Card. Circle No. 120

SANFORD BENCH SURFACE GRINDER
MODEL SG

for Wet*or Dry Grinding!

PRECISION • SPEED • SENSITIVITY

A *low cost*, precision machine for surface grinding dies, instrument parts, gauges and other small parts which would fit in the palm of the hand.

By using Sanford Bench Grinders many manufacturers of precision machinery have drastically cut over-all costs for finishing small intricate parts. This releases large, more expensive machines for heavier duty work.

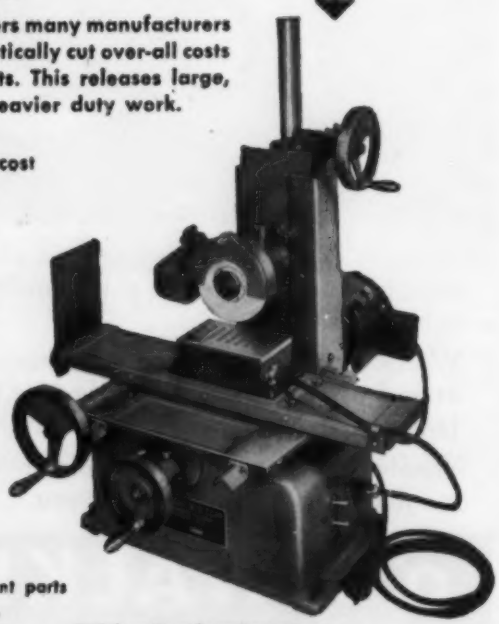
The Sanford SG is the *only* low cost Bench Surface Grinder that

- **Grinds to less than .0001" tolerances**
- **Operates without vibration**
- **Assures long life because Meehanite castings are used in its construction**

SPECIFICATIONS—4" traverse —8" longitudinal—6" vertical under 4" wheel. Approximate weight 160 lbs.

Complete details are included in illustrated bulletin. Send for your copy today.

Reconditioning facilities, replacement parts and special attachments are available. Send for price list.



**With optional equipment*

SANFORD MANUFACTURING CORP.
1026G Commerce Ave., Union, N. J.

Circle No. 245 on postpaid card

Single and Double Disc Sander and Grinder

Max Mfg. Co., 138 Stockton Ave., San Jose 26, Cal., has improved and expanded its line of disc sanders and grinders to include not only the widely used 16" and 20" sizes, but 24", 30", and 36" sizes as well, with single and double disc models in each size.

Originators of the table-on-the-column idea, this principle has been expanded to include two and four column models for the larger sizes. •

Use HANDY Postpaid Card. Circle No. 121

Light Unit for Precision Measurement of Flatness

Portable measurement of flatness is now within the reach of every metal shop with the introduction of the new low cost Mono-Light manufactured by the Spitfire Tool Co., 2931 N. Pulaski Rd., Chicago 41, Ill.

The unit features a helium lamp considered the most satisfactory light source for ultra-precision measurements. This lamp assures anyone can make precisely accurate measurements for flatness up to 1 light band (.0000116) or less after minimum practice.

Extremely compact design for easy portability is one of the outstanding features. It is a completely self-contained unit within its own sturdy metal case, only 5½ x 6 x 8¼ when closed.

To provide widest possible range of use for both small and larger piece parts, it has an extra-large opal glass lighting area, 4-1/3 x 7-½. In addition, dual vents are built into the case to give exceptionally cool operation of the heavy duty enclosed transformer. For exact, vibrationless measuring under all conditions, the unit is set on rubber mounts. •

Use HANDY Postpaid Card. Circle No. 122

Air Grinders Feature Doubled Power Capacities

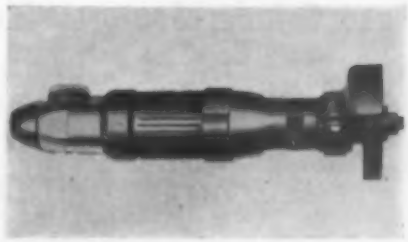
A new series of air-operated rotary grinders, with double the power of the models they replace in the line, has been announced by Thor Power Tool Co., Aurora, Ill.

Two models, the 3G and the 3GE, are the first units in the company's No. 3 series, and they replace the No. 10 series grinders as well as the 00H model. Streamlined and light in weight, they are designed for a wide variety of industrial uses.

The 3G grinders are to be made available in five versions, based on motor speeds of seven-, ten-, twelve-, fifteen-and eighteen-thousand rpm. The 3GE model will be furnished at 18,000 rpm only and features a tapered extension spindle support which extends approximately three inches beyond the spindle of the 3G series.

Intended basically for precision work and for production grinding in factories, foundries, shops and laboratories, the 3G grinders weigh less than 3-¾ pounds, have an overall length of 11¼", and operate at their respective speeds on air pressure of 90 pounds. They are equipped with ¼" air inlet pipe threads and take a minimum hose size of ⅜". They feature a thumb-twist throttle for sensitive control.

The 7000 rpm version takes a 3" vitrified wheel and the 10,000 rpm model a 2" vitrified wheel. Both have 3" wheel guards as standard equipment. The 12,000 rpm model takes a 2" vitrified and a 2½" bonded wheel and has a 2½" wheel guard. The 15,000 and 18,000 rpm versions take 1½" vitrified wheels. The former requires a 2½" and the latter a 2" bonded wheel. Appropriate sizes of wheel guards are also standard equipment on these grinders. The 3GE model takes a 1½" vitrified or a 2" bonded wheel.



Chief features of the new 3G rotary air grinders, in addition to the pronounced increase in power and the decreased weight, are a sharp reduction in the number of working parts and a 360° adjustable exhaust deflector. •

Use HANDY Postpaid Card. Circle No. 123

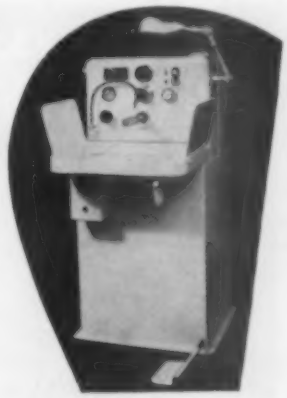
For Honing Perfection

nothing does it like the

NEW *Model H.M.* HONEMASTER

The First Real Advancement

in manually operated honing machines.



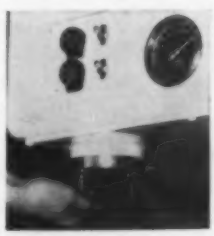
Hydraulic system assures

CONSTANT PRESSURE

with no fall off due to stone wear or stock removal.
Stone pressure control

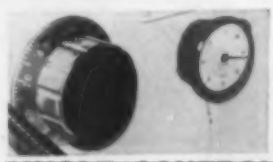
ADJUSTABLE TO MATERIAL and DIAMETER OF PIECE

Constant cutting action always! Hydraulic system also operates clutch and brake mechanism.



INFINITELY VARIABLE SPINDLE SPEED

250 to 1150 r.p.m. The right speed for work of any diameter, material or finish. Easy-to-read tachometer.



SINGLE CONTROL SIZING DIAL INDICATOR

Set indicator by honing first piece to finish size. Compensate only for stone wear thereafter. Sizing dial indicates when piece is coming to size.

Spindle has replaceable hardened pilot bushing, mounted on factory sealed bearings. Eliminates constant lubrication. Machine operates by foot pedal while standing, or knee pedal while sitting. All standard Superior mandrels adaptable.

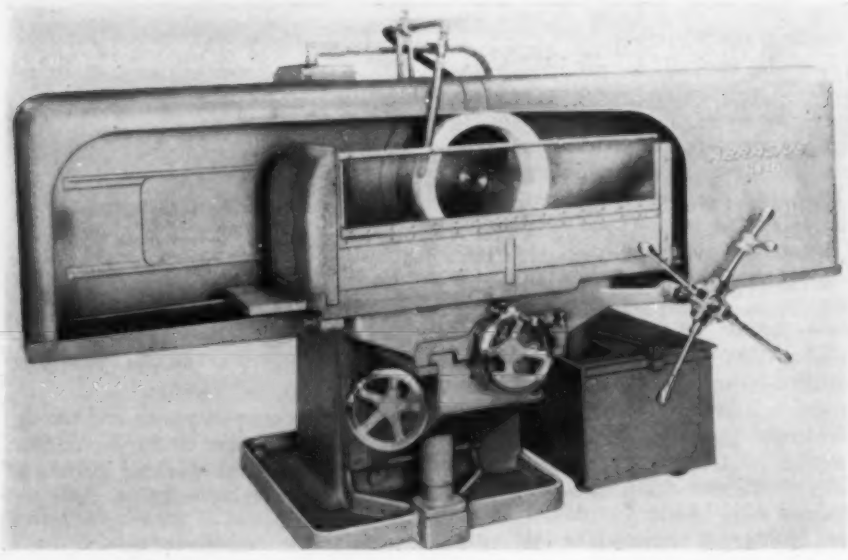
SUPERIOR HONE CORPORATION
1637 ELRENO STREET • ELKHART, INDIANA

Please send details on the Honemaster and free catalog and prices on other Superior Honing machines.

NAME .....
FIRM .....
STREET .....
CITY & STATE .....
NAME OF SUPPLIER .....

Circle No. 246 on postpaid card

Face Grinder Features Motorized Spindle



A new face grinder, with 18″ cup-shaped grinding wheel mounted perpendicular to the table, now incorporates a motorized spindle, eliminating pulleys and belts and furnishes a simple, exceptionally powerful drive. It is equipped with a 15 hp 900 rpm heavy duty motor. Box type construction provides maximum rigidity for accuracy in grinding any flat or square surface, as well as providing large bearing surfaces, easy maintenance and long life.

At 900 rpm, the grinder faces cold or hot rolled steel, tool steels, steel castings and all non-ferrous alloys. When used for grinding castings, it eliminates all milling or planing and requires less stock to be left on for finishing. This means that as much as 3/16 of an inch of stock can be saved on each surface. Applicable for any flat, square surface grinding job, it is currently in use for grinding automobile dies, plastic moulding dies, molded insulated fire brick, ceramic insulators and all types of forging dies. Abrasive Machine Tool Co., East Providence, R. I. •

Use HANDY Postpaid Card. Circle No. 124

Cylindrical Grinding and Indexing Attachment

Henry Owens & Co., Inc., 51 Washington Ave., Cranston 7, R.I., is now manufacturing a 616 cylindrical grinding and indexing attachment, which was formerly manufactured by Brown & Sharpe Mfg. Co.

This attachment is used for dry grinding small cylindrical work, tapers, and work requiring indexing on surface grinders. Grinding is done on dead centers. Work driving dogs with specially designed driving arms hold work without backlash, when indexing is required. For work not ground between centers an indexing spring chuck with spring collets is available, interchangeable with the standard index head. The motor is completely enclosed; ball bearings in index head and indexing spring chuck are permanently lubricated and sealed. •

Use HANDY Postpaid Card. Circle No. 125

LATEST DEVELOPMENT IN WHEEL GUARDS...FOR PORTABLE GRINDERS WHEN USING FLARING CUP AND STRAIGHT CUP WHEELS...

MORRISON CUP GUARDS

REVOLVING

REVOLVES WITH WHEEL

MAXIMUM STRENGTH AND SAFETY —Allows Full View of Work

Part	Size	List Price	
C-6	6	$4.90	FLARING CUP
C-5A	5	4.80	
C-5B	5	4.80	
C-4	4	4.70	
CS-6	6	4.90	STRAIGHT CUP
CS-5	5	4.80	
CS-4	4	4.70	

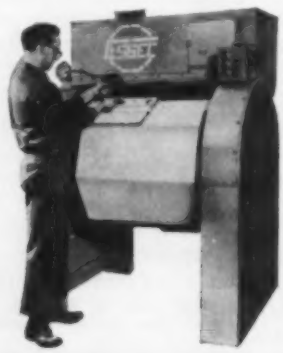
Adaptor for straight bushed wheel — list price $4.75

SEE YOUR GRINDING WHEEL SUPPLIER

MORRISON PRODUCTS INC. • 16816 Waterloo Road Cleveland 10, Ohio

Circle No. 247 on postpaid card

rugged enough for ball burnishing ESBEC series HD



ABRASIVE TUMBLING BARRELS never need babying, even on the toughest jobs. You can count on uninterrupted production, long life and low upkeep. They're truly heavy-duty, with extra-rigid welded-steel drums, oversize self-aligning bearings, plus power to spare. They give higher production rates with their low loading heights, large unobstructed door openings, quick-locking safety doors, and safe accessible controls.

All ESBEC barrel finishing equipment offers practical, profit-producing features based on first-hand experience in our own, and other finishing plants. Write for catalog today!

EQUIPMENT SUPPLIES ABRASIVES

ESBEC BARREL FINISHING CORP. 20 BEECH ST., BYRAM, CONN.

BOOTH 768 ASTE SHOW!

Circle No. 248 on postpaid card

Bond Segments for Grinding Ferrous and Non-Ferrous Metals

V-40 bond segments, for grinding all ferrous and non-ferrous metals, have been developed by The Carborundum Co., Niagara Falls, N.Y., and are now commercially available for immediate delivery.

Made of the highest grade of aluminum oxide abrasive grain, and with the same specially engineered bond as developed for Carborundum's V-40 tool room grinding wheels, the V-40 segments are made in the variety of shapes used in all standard chucks.

These abrasive segments have been specially designed for generating flat surfaces on plates, castings and machine parts and grinding machine knives.

Thoroughly field tested, the V-40 segments have shown outstanding advantages over other segments in cooler cutting action, longer life and better size holding ability. They are also more uniform in structure, and quality control from raw material to finished segments insures uniform duplication in repeat manufacturing runs.

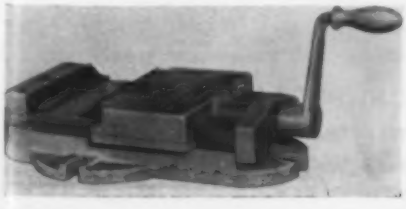
A new type of waterproof pad, applied to the segment with a special resilient cement, assures better holding power in the chuck. An additional handy feature is the recess in the end of the segment where the specification sticker is placed for easy reference to size, grit, grade and bond, and other information needed for reorders. •

Use HANDY Postpaid Card. Circle No. 126

New Hold-Down Vise Features Low Design

A 3" IMP Hold-Down vise has been added to the rapidly growing line of machine vises manufactured by Illinois Metal Products, 429 W. Superior St., Chicago 10, Ill.

The low design of the model 3, makes it especially adaptable for surface grinding non-ferrous metals. It works equally well for smaller milling jobs, too. It has two hinged pull-down jaws that pull the work downward and seat it accurately and tightly in seconds without the use of parallels or hammering. Interchangeable heavy hold-down jaws increase its versatility.



The clamping screw is half recessed into the base and on a direct line with the clamping position of the hold-down jaws. This construction eliminates springing or buckling of the base and since the base is designed with a shallow depth it adds additional rigidity. Work can be removed from the vise in the middle of a cut and replaced in the vise again with the same cut being picked up without leaving a trace of the step from the previous cut. A graduated swivel base is also available with a new feature, an adjustable pointer for the graduation lines. •

Use HANDY Postpaid Card. Circle No. 127

New Compound For Barrel Deburring of Small Parts

An alkaline material designed for the barrel deburring of small parts, is the newest addition to the line of barrel finishing materials available from Oakite Products, Inc., 157 Rector St., New York 6, N.Y.

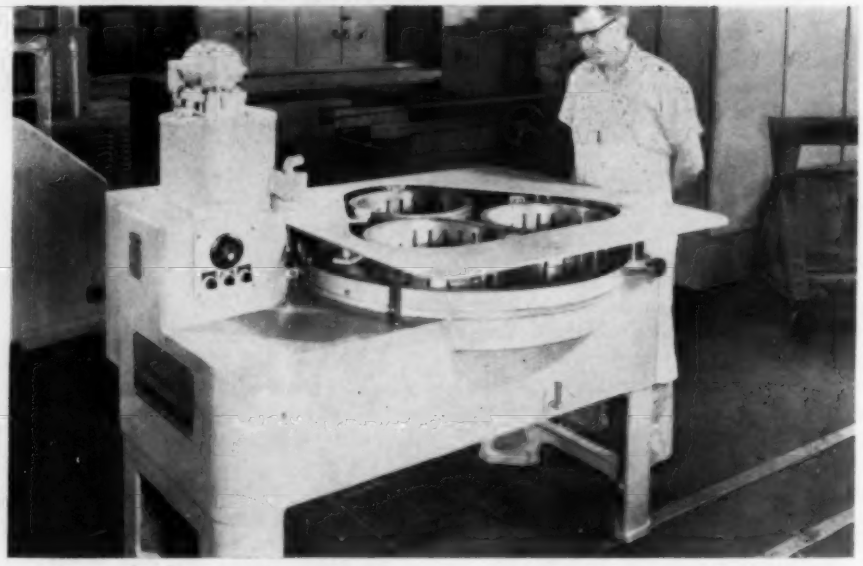
Called Oakite FM 183, it combines a fine, fast-cutting abrasive with surface active agents designed to keep media bright and sharp. Its use, alone or with stones, is said to save time and cut costs, and in many cases to eliminate individual handling of parts, hand filing and abrasive-belt operations. Used in concentrations of 1 to 5 ounces per gallon of water, it is designed for the deburring of stamped or machined parts, grinding off sharp edges, removing tarnish, rust, and heat scale, improving surface finishes, and deburring steel and zinc.

Use HANDY Postpaid Card. Circle No. 128

BLOHM
HORIZONTAL
SURFACE GRINDERS*
You'll be Amazed...
at the high quality job you can do with BLOHM's new line of horizontal surface grinders . . . and even more amazed at the extremely low cost!
Cross movement by the table assures maximum precision and accuracy. Powerful heavy-duty 5 hp motor mounted directly on spindle operating on adjustable oilmatic bushings – pressure lubrication – Use wheels up to 4" with cross feed up to 2½" per stroke
These features, plus the unusually sturdy overall construction, eliminate virtually all vibration and insure maximum concentricity
Exclusive BLOHM MICROTIP in-feed and depth-feed control permits automatic fingertip adjustment up to .0002" on cross feed and .00004" in depth feed
PRODUCTION PRECISION PRICE
MASERATI
Write, Wire or Phone for detailed descriptive literature.

Circle No. 249 on postpaid card

Thirty-Six Inch Lapping Machine



Higher capacity, handling of larger parts and other desirable advantages in precision production lapping operations are provided in a new 36-in. model Lapmaster lapping machine.

Inside diameter of the conditioning rings is 14-½", thus permitting handling parts up to that size. Capacity-wise, the machine will take well over twice as many 1" parts as the 24" model. The roller bar attachment has been designed to provide the operator with shelf space for placing pressure plates or fixtures.

The drain hole is on the side, and a wiper blade is fastened to the underside of the base table to bring all of the spent compound into the drain. A rubber hose, fastened to the drain plug, allows a container to be placed under the machine and conveniently out of the way.

A fork style agitator is placed at a 30° angle in the agitator tank. This has been done to facilitate mixing of abrasive when left loaded in the tank for an overnight period. This eliminates strain on the agitator motors.

Lapmaster lapping machines are capable of generating surface flatness to less than one light band and finishes to 2 rms in short or high production runs. They are widely used for lapping of parts such as adding machines, engines, transmissions, cameras and projectors, tool and die equipment and quartz and germanium crystals. Materials include monel, steel, stellite, brass, aluminum, glass, carbon, plastics, ceramics and others. Crane Packing Co., Dept. GFN, 6400 Oakton St., Morton Grove, Ill. •

Use HANDY Postpaid Card. Circle No. 128

Pastel Color Grinding Wheel

A pastel yellow vitrified grinding wheel, said to be a cooler cutting and more efficient tool, has been developed by Electro Refractories & Abrasives Corp., Buffalo, N.Y.

The attractive pastel color wheel has several advantages over conventional ones. It provides sharper contrast, enabling wheel operators to see the work better and assures quick recognition in the stockroom as a replacement item. •

Use HANDY Postpaid Card. Circle No. 129

aluminum oxide flours | **precision graded**

to micron sizes in grade Nos.

280
320
400
500
600
800
1000
1200

For lapping, honing and polishing operations where precision and uniformity are a must.

"MICRO-GRADED" ABRASIVES manufactured by:

K. C. ABRASIVE COMPANY
P.O. Box 4335 — 3101 Peery Ave.
Kansas City 27, Missouri
Write for prices and samples

Circle No. 250 on postpaid card

District Managers

EASTERN DIVISION
Dan E. Reardon, V.P.
c/o Hitchcock Publishing Co.
55 West 42nd Street
New York 36, N.Y.
Tel: LAckawanna 4-4528

NEW ENGLAND, EASTERN N.Y. STATE
Dan E. Reardon, V.P.
Box No. 1, South Glastonbury, Conn.
Telephone: MEdford 3-7083
John Pickering Jr.
592 Osgood St.,
North Andover, Mass.
Telephone: Lawrence 8-0913

NEW YORK, METROPOLITAN AREA
Martin J. Gallay
Raymond J. Sietsema
c/o Hitchcock Publishing Co.
55 West 42nd Street
New York 36, N.Y.
Tel: LAckawanna 4-4528

EASTERN PENNA., CENTRAL N.Y. STATE, N.J., MD., DELA., D. of C., BROOKLYN, N.Y.
Raymond J. Sietsema
c/o Hitchcock Publishing Co.
55 West 42nd Street
New York 36, N.Y.
Tel: LAckawanna 4-4528
Home tel.: (N.J.) CE 9-4364

CENTRAL DIVISION
Henry J. Smith, V.P.
c/o Hitchcock Publishing Co.
222 East Willow Avenue
Wheaton, Illinois
Telephone: WHeaton 8-3400

INDIANA, WESTERN OHIO, KENTUCKY
Henry J. Smith, V.P.
c/o Hitchcock Publishing Co.
222 East Willow Avenue
Wheaton, Illinois
Telephone: WHeaton 8-3400

MICHIGAN, NORTHERN IND., TOLEDO, OHIO
James C. Stewart, V.P.
18055 James Couzens Hwy.
Detroit 35, Michigan
Phone: Diamond 1-9525

ILLINOIS, WISCONSIN, IOWA, MINNESOTA, MISSOURI
Robert G. Bolinder
Marvin Matson
c/o Hitchcock Publishing Co.
222 East Willow Avenue
Wheaton, Illinois
Telephone: WHeaton 8-3400

WESTERN NEW YORK STATE, WESTERN PENNA., EASTERN O.
Ralph E. Helfrick
1507 Edgefield Road
Cleveland 24, Ohio
Telephone: HIllcrest 2-0189

WESTERN DIVISION CALIFORNIA, ARIZONA
Keith H. Evans
3723 Wilshire Boulevard
Los Angeles 5, California
Telephone: DUnkirk 8-2981
593 Market St., Room 304
San Francisco 5, Calif.
Telephone: YUkon 2-4280

OREGON, WASHINGTON
Lloyd Thorpe
531 Medical Arts Building
Seattle 1, Wash.
Telephone: Main 6827

HITCHCOCK PUBLISHING CO.
WHEATON, ILLINOIS
Telephone WHeaton 8-3400

New Instrument Checks Dial Indicator Accuracy

The "Master" dial indicator checker, a quick, easy-to-use method of checking the accuracy of all AGD indicators is now available from Petz-Emery, Inc., Pleasant Valley, N.Y. This instrument replaces the more difficult gage block method of checking. It provides large users of dial indicators and dial indicator service departments with a rapid, reliable means of periodic checking and enables them to check both new, incoming indicators for stated accuracy, and repaired indicators for original factory accuracy.

In operation, the accuracy of the dial indicator is checked against a large, calibrated wheel, 8" in diameter with a micrometer barrel as its hub. Graduations of .0001" are marked on the outer rim of the wheel and may be lined up with a hairline sight. The indicator contact point is set against the micrometer spindle by means of a vernier zero adjustment which does not require locking. The user merely turns the wheel for a given distance and then checks the resultant reading on the indicator. Readings to .00002" can be easily estimated. The "Master" checks indicators in all ranges up to 1.000". •

Use HANDY Postpaid Card. Circle No. 131

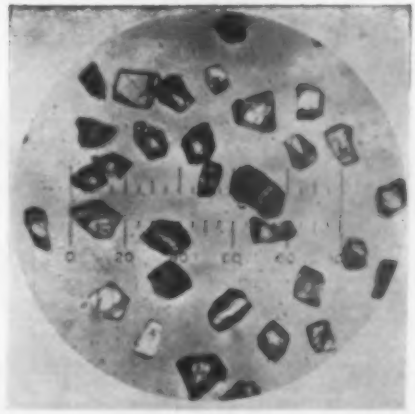
New Diamond Compound Speeds Lapping Operations

An effective lapping compound utilizing tiny diamond particles as an abrasive has been recently introduced by DI-MET Corp., 1893 Mullin St., Torrance, California. Photo micrographs of the compound show exceptionally uniform particle shapes and blocky structure of the diamonds, two factors which are responsible for fast cutting speed and mirror-bright finishes. This uniformity of size insures that all diamonds work with equal efficiency. With a variety of sizes only the larger ones are capable of abrasive action; effect of small particles is therefore wasted.

The Di-Met compound is ready for instant use, usually being applied to surfaces by means of a suitable gun. It is packaged in 20 gram and 5 gram units.

The diamond carrying vehicle of the compound is instantly soluble in water or commercial solvent insuring positive cleanliness when changing micron sizes. It has no tendency to thin out with heat or thicken and roll up under usage. Having excellent adhesion, the material sticks stubbornly to lapping surfaces, even under stress of centrifugal force, thus minimizing waste.

Applications of this compound speed final finish on molds, punches, tools, dies, gauges, rolls, bearings and races, valve seats, optical flats, and most other

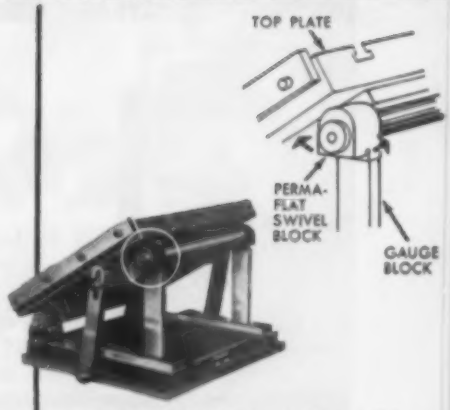


hard, metallic materials where lapped finishes are required. •

Use HANDY Postpaid Card. Circle No. 132

NOW! First Major Change in Sine Plate Design in 20 Years!

This exclusive, patented new feature in Robbins Sine Plate design means savings for every tool room! You'll save wear on sine bar rolls and costly gauge blocks, too, with the Robbins "PERMA-FLAT" swivel block, now found on every heavy duty sine plate we manufacture. The PERMA-FLAT swivel block distributes weight evenly over a large area of the gauge blocks on which it rests, rather than with the single line contact obtained using conventional sine bar rolls. Write for complete information on how Robbins Sine Plates save time and add accuracy on all angular machining and inspection set-ups.



Robbins Sine Plates make possible any angular set-up for machining or inspection to gauge block accuracy. Immediate delivery on 12", 24"—36" and 48" square models to order.

OMER E. Robbins COMPANY
24800 PLYMOUTH ROAD DEPT. H-6 DETROIT 39, MICH.

Also producers of special machinery, gages and fixtures

Circle No. 251 on postpaid card

New Gage Block Standards

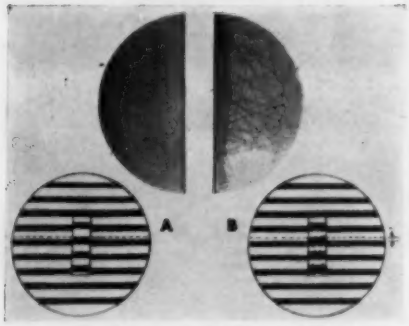


Fig. 1. While an ordinary microscope will reveal differences in gage block finish, interferometry exposes the readability of fringe line patterns which is a measure of the block's conduciveness to accurate calibration. Note clearly defined lines in DoALL block (A) having 0.09 microinch RMS finish. It can be calibrated to tenths of a millionth of an inch. Lack of definition in block (B) prevents calibration to this degree of accuracy.

The DoAll Co. of Des Plaines, Ill., has established a new category of gage block standards, "AAA" grade blocks made to the very close tolerances of plus or minus one millionth of an inch (.000001") per inch of length.

To establish the new dimensional standards for gage blocks, DoAll gage engineers perfected a process that produces an ultra fine surface finish of 0.09 microinch RMS on gage blocks. The significance of this finish is shown in fig. 1. The sharpness of fringe line definition as seen through interferometry reveals how the block having 0.09 microinch RMS surface finish can be read to tenths of a millionth. In contrast, blocks having a one microinch RMS surface finish cannot be accurately calibrated closer than two millionths of an inch. This ability to read such minute deviations from absolute dimension enables DoAll to produce greater accuracy in its gage blocks for dimensional size, flatness and parallelism.

Fig. 2. New DoALL "AAA" Grade Square and Rectangular DoALL Gage Block Sets No. 86 having one millionth accuracy and a surface finish of 0.09 microinch RMS.

They are available in square or rectangular blocks in sets of 86 pieces, Fig. 2. Each set is made up of selected blocks chosen for absolute accuracy and superior finish. Each block has been conditioned in the gage laboratory for one year before it is used in making up a set in order to assure its absolute stability and to check it against grand master gages calibrated by the National Bureau of Standards. In addition, each block is checked by absolute measurement—against light waves by interferometry. •

Use HANDY Postpaid Card. Circle No. 133

Diamond Powder Compound

Whittaker, Clark & Daniels, Inc., 260 W. Broadway, New York 13, N.Y., has announced the addition of a new line of diamond powder compounds. They are being offered under the trade name of Diadem.

Compounds are made by incorporating scientifically, graded and shaped diamond particles in a unique formula. The diamond particles, as used in the compound, are all prepared from pure virgin bort. The tubes each contain 5 grams of compound and are clearly marked to show their micron size. The container is polyethylene, permitting the consumer to readily determine how much unused material remains; and by its color, the micron size of the diamond powder may easily be identified. There are seven standard micron ranges available. These are produced in standard concentration; and also—light and heavy. The standard concentration is recommended unless the specialization of the special use demands the other weights. •

Use HANDY Postpaid Card. Circle No. 134

L-W MAGNETIC CHUCKS

GRIP WORK TIGHTLY for Wet or Dry Grinding

Guaranteed waterproof. Connections for either 110 or 220 v. D.C.

Working Surface

5¾" x 13 .....$ 63.00
6½" x 18 .....$ 80.00
8" x 24" $156.00
10¾" x 37" $296.00

RECTIFIERS

A. C. input 110 volts; D. C. output 110 volts. P-1 for 5¾" x 13" chuck 0.8 amps. $54.00
P-2 for 6½" x 18" chuck 1.0 amps. $62.50
P-3 for 8" x 24", 10¾" x 37" chuck 3.0 amps. $80.00

DEMAGNETIZING SWITCHES

For 5¾" x 13" and 6½" x 18" sizes. $12.50
Field discharge type for 8" x 24" and 10¾" x 37". $22.00

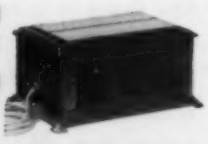
ROUND TYPE
3¾" opening
$27.50

DEMAGNETIZERS
Instantly demagnetize tools or production parts. No moving parts. 110 v., 60 cy. A.C.

PLATE-TYPE

MODEL B-2
7¼" x 12½" x 8¾" Ship. wt. 55 lbs. $78.00

MODEL J-1
7¼" x 7¼" x 8¾" Ship. wt. 35 lbs. $54.00



See your dealer or order direct, giving dealer's name.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 80 SO. ST. CLAIR ST. TOLEDO 4, OHIO

Circle No. 252 on postpaid card

Cylindrical Grinder for Repetitive Grinding

A cylindrical grinder, manufactured by the American Herforder Corp., 1546 N. Orleans St., Chicago, Ill., was designed for fast repetitive grinding as well as for toolroom work.

Work capacity is up to 4" dia. by 12" in length, with maximum production grinding recommended at 1½" dia. The work head accommodates No. 1 Morse centers, both live and dead, as well as 4" three-jaw tapered draw-in chuck, and quick change collets up to ⅜" capacity.

The machine is equipped for both plunge and traverse feed grinding, with automatic infeed at the stops. Work head speeds are variable from 125 to 610 rpm. The wheel spindle carries a 12x1x3" wheel powered by a 1¼ h.p., 3 phase 60 cycle motor. Work head and coolant pump are wired into main controls so that both stop automatically for work change at final size. •

Use HANDY Postpaid Card. Circle No. 135

Precision Barrel Finisher Features Sliding Action

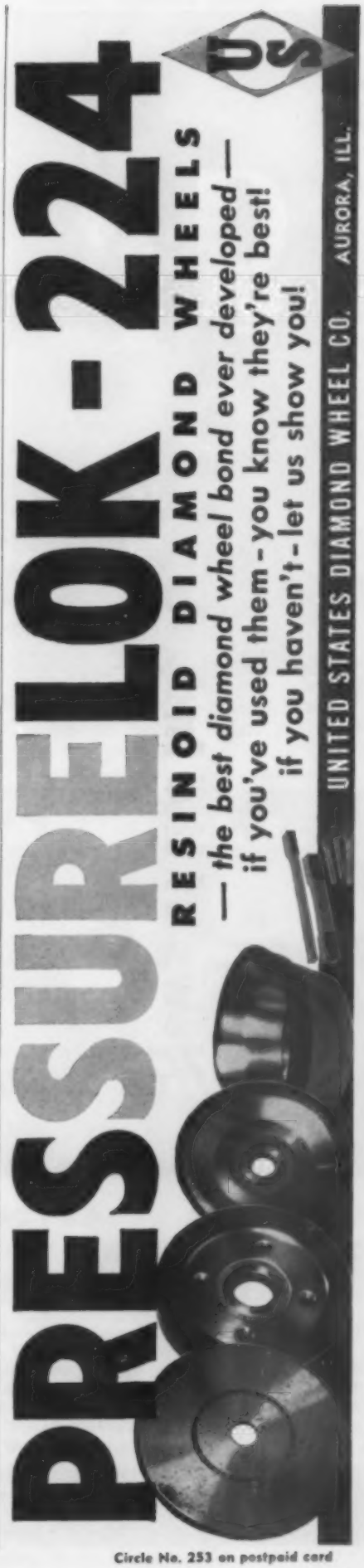
A barrel tumbler or precision barrel finisher of the bench type is now being manufactured by Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago 7, Ill. It is called the Handee Slide-Abrader as this best describes the method of deburring and finishing.

The work is not actually tumbled but slides in the six sided barrel or drum against the Novaculite which is the abrading agent. In utilizing this system, limits of .001 are held and on electronic work, the work is not charged. This lightweight equipment takes up only 16 x 23 inches of bench space.

The unit is powered by a ¼ hp, 1750 rpm electric motor. The drive is direct with three speeds available, 20, 25 or 35 rpm, thus giving a range that can handle nearly every type of work.

Small metal fabricating shops will find this unit ideal for finishing and deburring parts, as the Neoprene lined drum can be picked up and the equipment taken to a machine or to a convenient outlet for draining, unloading or reloading. •

Use HANDY Postpaid Card. Circle No. 136


PRESSURE LOK - 224
RESINOID DIAMOND WHEELS
— the best diamond wheel bond ever developed —
if you've used them - you know they're best!
if you haven't - let us show you!
UNITED STATES DIAMOND WHEEL CO. AURORA, ILL.
US

Circle No. 253 on postpaid card

News of the Industry

Speed-D-Burr Builds Los Angeles Factory

Ground has been acquired and construction work will soon begin on a completely new, modern design factory for the Speed-D-Burr Corp. of Glendale, Calif., according to Haskell J. Miller, president.

The new plant, costing more than $250,000.00 will be located near Lomita and South Main in Los Angeles and will more than triple present manufacturing facilities. Planned for the new plant will be barrel finishing laboratories for experimental, customer service and planned research into barrel finishing problems.

The present plant in Glendale will continue to operate at full capacity for service to industry in the northern and western areas. Here, customer experimental and processing work, job work and media and compound storage will be further expanded to give even more complete service to companies in those areas.

Norton Co. Receives Defense Dept. Award

Rear Admiral John A. Snackenberg, USN, commandant of the first naval district, made the first New England presentation of the Department of Defense Reserve Award to Norton Co., on May 25th. This recently authorized award was established to honor companies whose policies regarding employee-reservists serve to encourage active participation in reserve activities.

New Distributor for Bay State

The Bay State Abrasive Products Co. of Westboro, Mass., has announced the appointment of the Industrial Abrasives Co. of 21630 Wyoming, Oak Park, as its distributor in the Detroit area.

Arthur L. Pierce Dies

Arthur L. Pierce of American Emery Wheel Works passed away on May 28, after many years service with the company. Funeral services were held on May 31st, in East Providence, R.I.

William R. Moore on American Panel to Tour Japan

William R. Moore, retired vice president of Norton Co., will be a member of a five-man panel of American business experts who will spend several weeks in Japan holding a series of seminars in that country to help introduce modern American business methods to the Japanese.

The tour is being sent to Japan by the National Cooperation Administration of the Department of State, through the cooperation of the Council for International Progress in Management.

Herbert I. Segal Elected President of Van Norman

Herbert I. Segal, a director of Van Norman Industries, Inc., manufacturers of machine tools, textile machinery and electronic components, was elected president of the company at the annual meeting, March 15.

Mr. Segal, who has been engaged in the machinery business or related fields since 1914, is also president of Segal Affiliates, Inc., of New York City, business counsellors; chairman and director of Hasco Machinery Co. of Newark, N.J., distributors of machine tools; and vice-president and director of Curtice-Lyle Properties, Inc., and Rochester Industrial Terminal, Inc., both of Rochester, N.Y., operators of industrial property.

New Distributor for Ultra-Sheen Metal Finishes Div.

The Ohio Hydro Deburring Co., 109 Avon Ave., Cleveland 5, O., has been appointed as the first distributor in Ohio to represent Ultra-Sheen Metal Finishes Div. of B. W. McIntyre Co. of Reseda, Cal.

The firm has had many years of experience in operating a job deburring shop and is well qualified to sell and service barrel finishing equipment and supplies.

Esbec Appoints Illinois Deburring Co. as Representative

To serve the growing needs of its customers in the Chicago area, the Esbec Barrel Finishing Corp., Byram, Conn., has announced the appointment of the Illinois Deburring Co., 3159 W. Madison, Chicago, as Northern Illinois representatives for Esbec equipment, compounds and abrasives.

The Chicago company is the largest tumbling job shop in the Midwest area. Its owners and partners, George F. Peterson and Henry Latz, have been well known throughout the area for many years as specialists in all phases of tumbling and barrel finishing operations.

Machinists' Tool & Supply Co., New Hyprez Distributors

Engis Equipment Co., Chicago, manufacturers of Hyprez diamond compound, has announced the appointment of Machinists' Tool & Supply Co., 3690 Santa Fe Ave., as exclusive stocking distributors for Los Angeles and Southern California.

In addition to Hyprez Machinists' Tool & Supply Co. will stock a complete line of accessories, such as lapping sticks, cylindrical and conical bobs, Hydulignum lapping wheels and other Hyprez products.

EFFICIENT—LOW COST

Dust Collection

Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units; or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

DUSTKOP STOPS DUST

37 STANDARD MODELS TO CHOOSE FROM

• READY TO USE

Also a Complete Line of Mist Collectors

AGET MANUFACTURING COMPANY

1380 E. CHURCH ST. • ADRIAN, MICHIGAN

Circle No. 254 on postpaid card

THE SMOOTHNESS AND TRUE BALANCE OF WHEELS YOU GET WITH "PLACE" DRESSERS.

Ball bearings eliminate drag . . . Increase grinder life . . . Reduce burning hazard . . . More pieces produced per grinding . . . True balance assures greater safety. Return dresser for reconditioning . . . new tool guarantee. Unit is interchangeable with all our holders. Special dressers made to order to fit any machine. Complete line of "Place" dressing tools manufactured, dating back to 1917 . . . Write for complete catalog.

ABRASIVE TRUING TOOL CORP.

FREELAND MICHIGAN

Circle No. 255 on postpaid card

Tough grinding jobs?

Check Vulcanaire high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

Major Vulcan Services

Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

VULCAN TOOL CO.

743 LORAIN STREET • DAYTON 10, OHIO

Circle No. 256 on postpaid card

INDEX TO ADVERTISERS AND PRODUCTS

(With a List of Their Advertising Agencies)

A

Abrasive Machine Tool Company (Surface Grinders) 22, 23
Creamer-Trowbridge Company
Abrasive Products, Inc. (Abrasive Belts) 46
Horton-Noyes Company
Abrasive Trueing Corporation (Wheel Dressers) 81
W. B. Donner & Company
Aget Manufacturing Company (Dust Collectors) 81
Beeson-Reichert, Inc.

B

Bay State Abrasive Products (Grinding Wheels) 43
Berg-Marshall, Inc.
Bearings, Inc. (Spindle Repair Service) 60
Brad Wright Smith Advertising, Inc.
Blanchard Machine Company (Surface Grinders) 9
Henry A. Loudon Advertising, Inc.
Bryant Chucking Grinder Company (Vertical Cam Grinder) 10
Henry A. Loudon Advertising, Inc.
Buckeye Tool Corporation (Rotary Air Tools) 6
Industrial Advertising Service

C

Carborundum Company (Abrasive Grains) .....4th Cover
Comstock & Company
Chicago Wheel & Manufacturing Co. (Mounted Wheels) 7
Frank C. Nahser, Inc.
Cincinnati Milling Machine Company (Grinding Machines) 2, 3
Jaap-Orr Advertising Agency
Clipper Diamond Tool Company (Diamond Tools & Wheels) 69
Harry Hurst Advertising
Cortland Grinding Wheels Corp. (Grinding Wheels) 47
William B. Remington, Inc.
Crystal Lake Grinders (Grinding Machines) 83

D

Diamond Tool Research Corp. 66
Dumore Company (Hand Grinders) 5
Stoetzel & Associates, Inc.

E

Electro Refractories and Abrasives Corp. (Centerless Grinding Wheels) 16
Tyler Kay Company
Elox Corporation of Michigan (Electrical Discharge Grinders) 34
Tech Agency
Engelberg Huller Company (Abrasive Belt Grinder) 69
Barlow Advertising, Inc.
Esbec Barrel Finishing Corp. (Tumbling Barrels) 74
P S Advertising, Inc.

F

Federal Products Corp. (Air Gages) 17
Horton, Church & Goff Company
Field Company, Inc., William H. (End Mill Grinders) 63

G

Gallmeyer & Livingston (Surface Grinders) 84
Van Stee, Schmidt and Sefton

H

Hanchett Magna-Lock Corp. (Magnetic Chucks) 67
Paxson Advertising, Inc.
Harig Manufacturing Company (Grinding Fixtures) 48
Conner Associates
Haskins Company, R. G. (Air Grinder) 52
Lester L. Jacobs, Inc.

I

Industrial Filtration Company (Filtration Systems) 45
Drennan W. Hart and Company

J

J & S Tool Company, Inc. (Wheel Dressers) 64
Gordon A. Pihl & Associates

K

K. C. Abrasive Company (Aluminum Oxide Flours) 76

L

L-W Chuck Company (Magnetic Chucks) 78
Wendt Advertising Agency

Lee Company, K. O. (Motor Driven Work Head) 56
Acme Advertising Agency

M

Macklin Company (Grinding Segments) 4
Rumsey & Associates

Maserati Corporation of America (Surface Grinders) 75
Gamut Advertising

Mattison Machine Works (Vertical Rotary Grinders) 20
Howard Monk & Associates, Inc.

Merit Products, Inc. (Sanding & Deburring Machines) 51
Dozier Eastman & Company

Morrison Products, Inc. (Revolving Cup Guards) 74
Baker & Baker & Associates, Inc.

Motch & Merryweather Machinery Co. (Grinding & Cutting Coolants) 13
C. A. Reece Advertising

N

Norton Company, The (Grinding Wheels) 18, 19
James Thomas Chirurg Company

Nu-Matic Grinders, Inc. (Grinding Wheels) 57
The Dwight Miller Company

P

Peninsular Grinding Wheel Company (Grinding Wheels) .....3rd Cover
Brooke, Smith, French & Dorrance, Inc.

Pratt & Whitney Company, Inc. (Wheel Forming Attachments) 30
Hugh H. Graham & Associates, Inc.

Production Machine Co. (Centerless Grinding Machines) 62
Charles Palm Company

R

Ready Tool Company (Grinding Centers) 65
Bass and Company

Robbins Company, Omer E. (Sine Plates) 77
Gray & Kilgore, Inc.

Royal Master, Inc. (Centerless Grinder) 70
S. M. Ferrer Advertising

S

Sanford Manufacturing Company (Bench Surface Grinders) 72
Advent Associates

Simonds Abrasive Company (Grinding Wheels) 37
Fox & Mackenzie Advertising

Simonds Worden White Company (Grinding Wheels) 61
Ralph E. Cooper Company

Smit and Sons, Inc., J. K. (Diamond Wheels) 8
Reid, Decker and Stocki, Inc.

Sundstrand Magnetic Products Company (Magnetic Coolant Separators) 68
George R. Holt, Advertising

Sunnen Products Company (Honing Machines) 11
H. George Bloch Advertising Co.

Superior Hone Corporation (Honing Machines) 73
Wendt Advertising Agency

T

Taft-Peirce Manufacturing Company (Surface Grinders) 12
Sutherland-Abbott

Texas Company, The (Coolants & Lubricants) .....2nd Cover
Ervin, Wasey & Company, Inc.

Thompson Grinder Company (Surface Grinder) 24
Emerson H. Mook, Inc.

U

United States Diamond Wheel Company (Diamond Wheels) 79

V

Van Norman Company (Centerless Grinders) 15
Sutherland-Abbott

Vulcan Tool Company (Rotary Tables & Adapters) 82
Chester C. Moreland Company

W

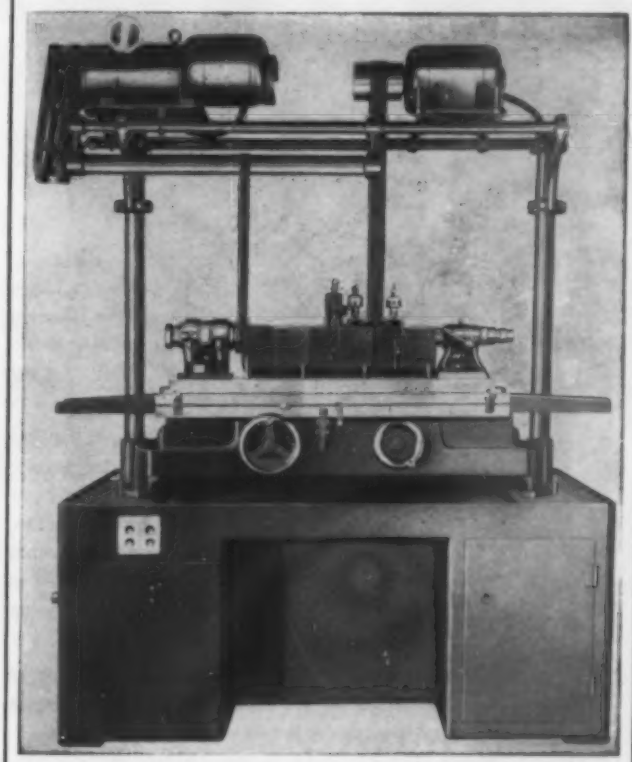
Walker Company, O. S. (Magnetic Chucks) 71
John W. Odlin Company, Inc.

Walls Sales Corporation (Belt Sanders) 67
The Powerad Company, Advertising

White & Bagley Company (Industrial Lubricants) 59
John C. Dowd, Inc.

WHY WILL A 1956 CRYSTAL LAKE GRIND ROUND FROM .000005 TO .000020 BOTH LIVE AND DEAD CENTER?

Your 1956 Crystal Lake Grinder can be equipped with Rex Super Van High Speed Steel, double taper spindles. Due to their high hardness, high tungsten content, spindles will run without clearance in bearings after they have been stabilized and ground to .000005 in. roundness. Spindles are set in boxes with heavy oil drag, and, DUE TO THE NINETY DEGREE OVERHEAD DRIVE, AMPLE POWER CAN BE USED TO ROTATE SPINDLE WITHOUT HEADSTOCK AND WHEELHEAD BECOMING CUMBERSOME AND HEAVY TO MOVE FOR SHOULDER GRINDING, ALSO, BELT PRESSURE IS NINETY DEGREES FROM GRINDING PRESSURE.



A choice of General Electric Thymotrol, General Radio Variac, or Variable Speed Drive can be used without ripple or cine' wave being transmitted to work as all motors are mounted on self-contained countershaft.

Write for literature

CRYSTAL LAKE GRINDERS

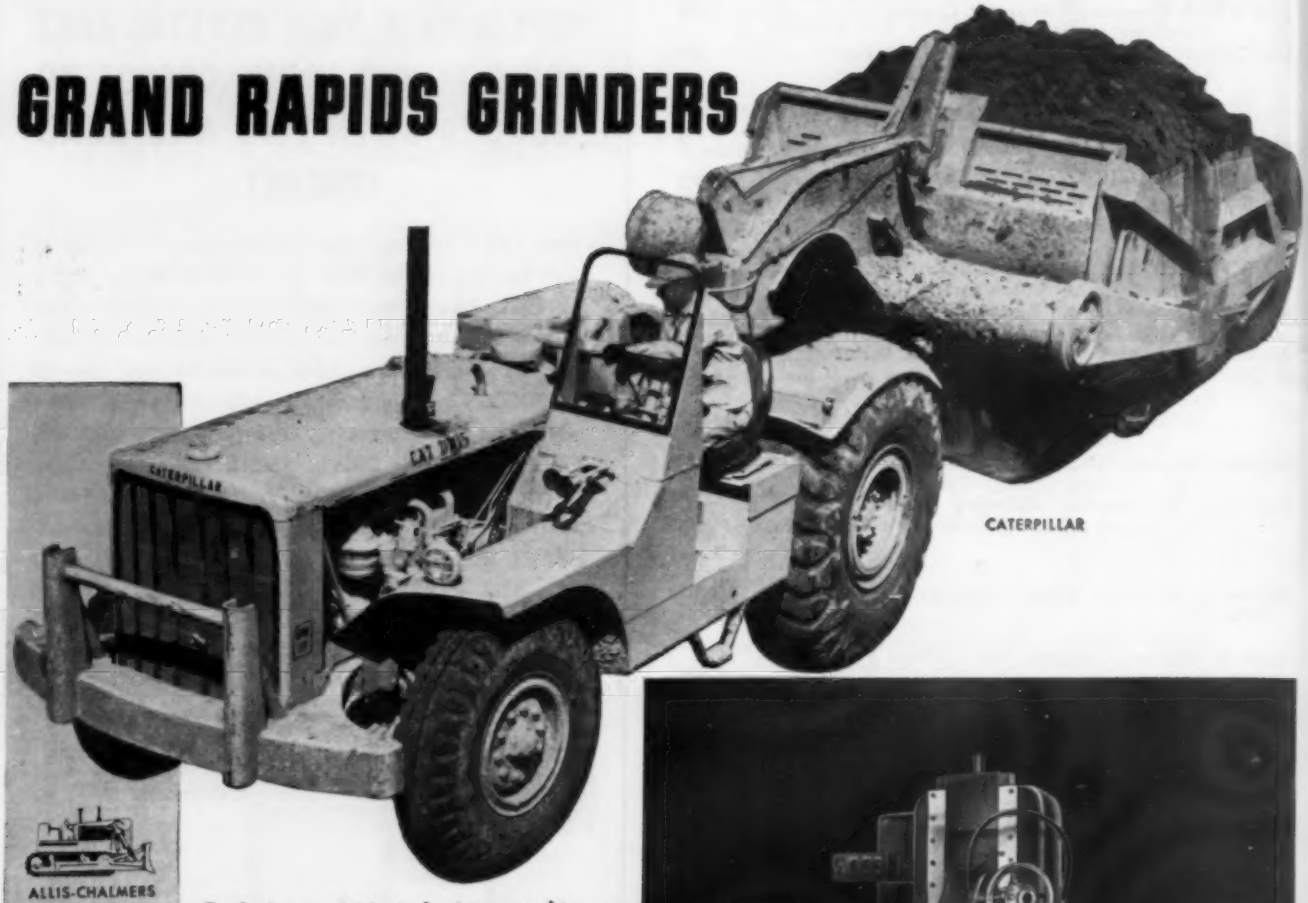
Since 1910

CRYSTAL LAKE, ILLINOIS

Circle No. 237 on postpaid card

FOUND WHERE WORLD FAMOUS TRACTORS ARE "BORN"

GRAND RAPIDS GRINDERS



CATERPILLAR

ALLIS-CHALMERS

CASE

DEERE

INTERNATIONAL HARVESTER

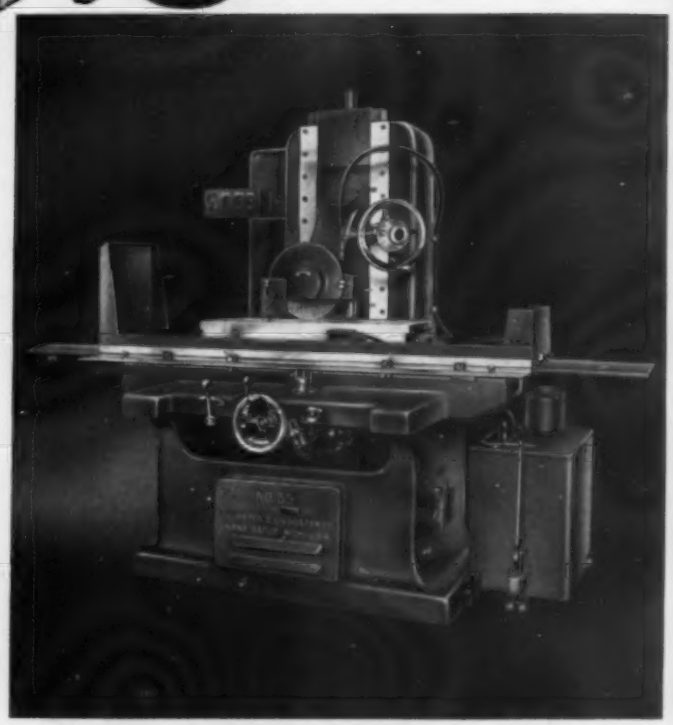
R. G. LeTOURNEAU

MASSEY-HARRIS-FERGUSON

Producing an intricate business machine requires exceptional toolroom precision. That's why these manufacturers use Grand Rapids Grinders . . . engineered to achieve extraordinary grinding precision at cost-cutting speed.

Model No. 55, at right, offers such features as one-piece column and base for permanent, vibrationless alignment, wheel head with powered rapid vertical travel, hydraulically actuated cross feed and longitudinal travel table. And it's the fastest grinder of its size and type, with a variable table speed up to 125 fpm!

Whether you make business machines or bulldozers, you can count on Grand Rapids Grinders for maximum toolroom precision.



GRAND RAPIDS NO. 55 HYDRAULIC FEED SURFACE GRINDER. Table speed up to 125 fpm. Working surface of table is 12" x 36". Vertical movement of wheel head is 18". Preloaded ball bearing spindle greased for life. Spindle speeds 1925 and 2500 rpm.

GALLMEYER & LIVINGSTON

Write for full information.

GALLMEYER & LIVINGSTON CO. 416 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

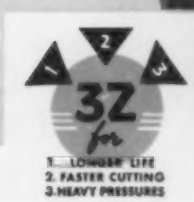
Circle No. 258 on postpaid card

FIVE YEARS OF BASIC RESEARCH ASSURES—

LONG LIFE
FASTER CUTTING
HEAVY PRESSURES
FOR USERS *of*

PENINSULAR'S NEW "3Z" SNAGGING WHEEL

1951 1952 1953 1954 1955 1956



FOR SLAB GRINDING

The new "3Z" combination of denser structure and faster, easier-cutting abrasive grains creates unusual opportunities to speed up grinding of slabs. The "3Z" Wheel lasts much longer on rough, wide area work, cuts costs and schedules at the same time.

FOR BILLET GRINDING

Peninsular's near-zero porosity makes available a wheel whose special abrasive grains stand up under the sudden shocks of billet grinding. The New "3Z" Wheel is an easier-handling unit that eliminates worker fatigue. It is smooth-running and easily controlled.

FOR HEAVY PRESSURES

The New "3Z" Wheel holds its own against the demands of mechanical snagging and other heavy duty grinding. In spite of its rugged, compact grain, "3Z" acts like a much softer wheel because of the unusual characteristics of its new type bond.

PENINSULAR

GRINDING PENINSULAR WHEELS

Circle No. 312 on postpaid card

PENINSULAR GRINDING WHEEL DIVISION—ABRASIVE AND METAL PRODUCTS COMPANY—DETROIT, MICHIGAN

VOLUME

TIGHTLY BOUND

BEST COPY

AVAILABLE